THE BOOK of KNOWLEDGE

The BOOK *of* KNOWLEDGE

The Children's Encyclopedia

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DEPARTMENTS

The Earth	The United States
Stories and Legends	Familiar Things
All Countries	Our Own Life
Golden Deeds	The Fine Arts
Helps to Learning	Men and Women
Literature	Poetry and Rhymes
Animal Life	Plant Life
Famous Books	Things to Make
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Book of Wonder

VOLUME VIII

New York

THE GROLIER SOCIETY

LONDON: THE EDUCATIONAL BOOK COMPANY

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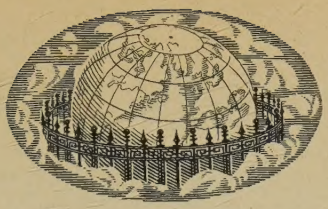

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This is a short guide to the principal contents of this volume. It is not possible to give all of the questions in The Book of Wonder, or the titles of all of the Little Verses and Problems, but in all cases the pages are given where such sections of the book begin. In the big Index, Volume 20, you will find every title and every subject, including the pictures.

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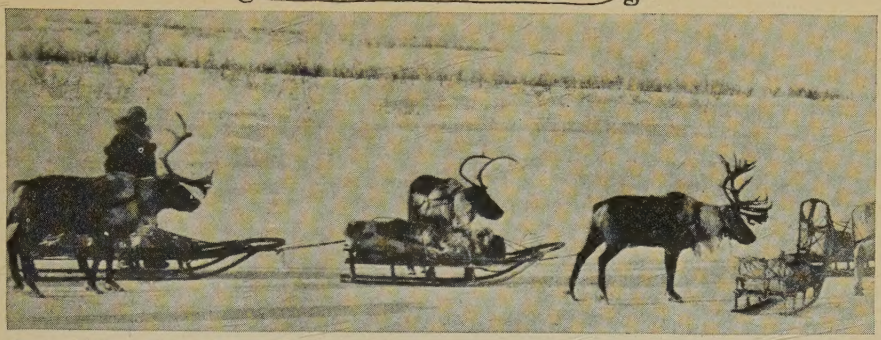


Photo, United States Postal Service.

In Alaska the mail-carrier uses reindeer to pull the mail sledges.

HOW OUR LETTERS COME TO US

CONTINUED FROM 2555

ONE of the most interesting stories of everyday life can be told about the work of the postal service. It seems magical that a bit of paper with writing on it can be sent anywhere in the world and finally reach the one person for whom it is intended. We may think that postal service was made possible by fast trains, fast steamships and even airplanes, so it will be a surprise to learn that long before such inventions were made, peoples of very early times wrote and sent letters. Indeed, the Bible tells of letters written by King David, a thousand years before Christ was born. The Assyrians and Persians, the ancient Greeks and Romans, and the Chinese had ways of sending written word throughout their different kingdoms. In fact, the word *post* comes from a Latin word *positum,* which means "placed" or "fixed." The old Romans had posts where horses were kept at intervals along the roads which stretched like a network across the Roman Empire. At these posts the messengers carrying letters on public business would stop to change their tired animals for fresh ones. But in those ancient days royalty, members of the nobility and very powerful soldiers or merchants were the only people who sent letters because of the expense.

It was not until the sixteenth century that letter posts began for private and business purposes. Roger, Count of Thurn, established riding posts in the Tyrol, and Sir Brian Tuke became first English postmaster general. For a long time such service was very expensive and very slow. The earliest postal service on the North American continent was established in 1672, when Governor Lovelace of the New York colony started a monthly service between New York and Boston. A hundred and twenty-three years later, after the American Revolution, there were 453 post offices in the United States, and mail was carried by horse, stage or sailing packet over 13,000 miles of postal routes.

In those days, and for many years afterward, there were no stamps, but letters were charged for according to the number of sheets of notepaper used. In 1837 an Englishman, Rowland Hill, suggested the use of stamps. England took up the idea and the United States followed. Soon all the civilized world was using stamps. Briefly, that is the history of our present postal system. Now let us find out what really happens to a letter that is properly stamped and sent upon its travels.

When we drop a letter into the box

at the corner of the street, or into a little window at the post office, with a comfortable feeling that "the Government" will take care of it, we sometimes wonder how "the Government" will take care of it. Therefore we are going to read about the adventures of the letters that drop helter-skelter into that selfsame box, and find out for ourselves how it is that they are sent, with the unerring flight of an arrow, straight to their destination.

For some time letters had been dropping into the dark interior of the post box in a great city at a corner where two streets meet. At first they came slowly, but as the time when the postman came to empty the box drew near, they followed one another thick and fast, like falling leaves on an autumn day. At the last moment a boy rushed up, and in his haste dropped his letters face downward on the muddy street. He picked them up and thrust them in the box in such a state that, if they could, the other letters within would have shrunk from them with horror.

Presently, punctual to the minute, the gray-clad postman, faithful representative of the Government, appeared. He unlocked the box, swept the letters in a confused heap into the pouch which hung suspended from his shoulder, and then trudged away. Box after box was unlocked and swept clear of its contents. When his appointed round was completed he carried the now heavy bag to the post office and gave up his charge.

How the stamps on our letters are canceled

At the post office the bag was unlocked and its contents, with that of many other bags just like it, were poured into chutes down which they slipped to long iron tables in a room below. There they were seized upon by men who, as they gathered them up, turned the envelopes so that the stamps faced all one way. When this was done, they were packed by a mechanical contrivance in orderly rows on the table of an electrical machine. The man at this machine rushed the letters through it. When they came out each one bore on its face the wavy line which cancels the postage stamp and a round stamp with the date of the month and year and the name of the post office.

As fast as the letters came out of the canceling machine they were gathered together and given to men who rapidly sorted them to see whether the address said they were to be sent to someone in the same city or in the same state, to someone in another state, or to someone living in a foreign country.

After the letters had gone through this first sorting they were taken to the men at the final-sorting racks. Standing in front of the rack made, for instance, to hold the Pennsylvania letters, a man picked up bundle after bundle of letters and with great rapidity sorted them into the pigeonholes marked with the names of the post offices corresponding to the addresses on the envelopes. When this was done, the letters were tied in bundles, and they were then ready for the waiting mail bags.

Each bag had a tag which showed the time at which its train would leave. As that time drew near, the bag was locked, and with numbers of others it was loaded on a truck and sent off to the railway station.

The same thing was being done at the same time, by other men, for the letters from our box which were to be sent to every other state in the Union, to Canada, to Europe, even to far-away corners in little-known parts of the world. Some of the letters had to wait for a ship to take them on their way. Some of them would take months to reach their destination, and might make the last part of their journey in a bullock cart in India. Some of them might be carried to their owners by Kafir runners in Africa. Perhaps the bags that had just reached the post office from a great liner held letters that had been carried on the first steps of their long journey in the same primitive way.

How our letters should be addressed

Most of the letters, of course, were neatly and carefully addressed, with the stamp put straight and square in the upper right-hand corner of the envelope. These all passed through the hands of the sorters with extreme rapidity. A few letters, however, were incompletely addressed, or the writing was so bad that the sorters could not stop to read it without delaying the rest of the mail, and on some of them the stamp had been carelessly stuck in the wrong place and had not been touched by the canceling machine. These were tossed aside to be picked up by another man who cancels the postage stamp with a hand-stamp or

THE STORY OF THE GREEN MAIL BOX

When you post a letter to your friend in this letter box you need have no fear. The letter will find its way safely to any part of the world. Letters in this box may go to India, Japan, France, Chile, or around the corner.

Nobody but the postman can touch the letter after you have posted it. The postman clears the box and carries the letters in his bag to the post office, where they will be started on the way to their owners.

© Underwood & Underwood.

This is a scene in a large post office after the receipt of letters which have come from another city. Mail bags are being brought to the table, where the contents of other bags have been piled already. You may notice the bundles which were tied in the post office, where the letters were mailed, or in the mail cars.

reads the badly written address, and sends the letters with incomplete addresses to the Dead-letter Office, unless indeed they have return addresses on them, when, of course, they are returned to the writer. All this took time. Some of the carelessly addressed letters missed the first mail.

Here it is well to say that at Christmas time the Dead-letter Office is filled to overflowing with articles meant for Christmas gifts. Sometimes this is because packages are not properly tied or the addresses are not correct. Sometimes the sender has not put his or her address on the wrapper or even inside the package. Then the poor Christmas gift is hopelessly lost. It is put away by the Dead-letter Office until the Post Office Department holds an auction and sells all such unclaimed articles to the highest bidder.

At last we hear the postman's knock, and our little friend receives her letter. It has come safely after many exciting adventures by land and sea, and we may be sure that it is opened with great delight.

So far, we have thought only of the letters which were addressed to out-of-town places. Now we must come back to the letters which bore city addresses. As fast as these letters could be sorted they were packed in steel cylinders. A man slipped the cylinders into a pneumatic tube, and off they went, driven by compressed air, through a little subway, to the next branch station. There a man, stationed at the tube, picked out the cylinders meant for his own post office and sent the others on their way. Thus they went from station to station until the last one reached its journey's end. It is fascinating to watch the tubes open and the cylinders slide out swiftly and quietly on their steel tables as if they knew they had come home to rest.

These tubes are built only in very large cities like New York, Chicago and San Francisco. In most places the letters are locked up in a post-office wagon and sent to the branch office to be sorted by the letter-carriers. Some letters are meant for the district to which the post office belongs, and these are sorted out according to their street addresses by the letter-carriers, who drop them into their pouches and tramp off on their rounds, carrying messages of sorrow or of joy.

Now let us go back to the bags which the train is bearing out of the city, for there is much work still to be done for the letters in those bags before they are delivered to their owners in the places to which they are addressed.

HOW, AS THEY ARE CARRIED THROUGH THE COUNTRY, THE MEN WORK

You remember that we stood for a moment beside the man who sorted the letters for Pennsylvania. Now that man, and other men like him, sorted by themselves all the letters that they found addressed to Philadelphia. The man who filled the bags put them into a sack marked for that city. This was not opened until it reached Philadelphia, but there the letters had again to go through a process of sorting. Some of them were addressed to small offices around Philadelphia. The man who filled the bags knew that the quickest way to send them was to let them go to Philadelphia first. So he put these letters also into a bag to be sorted by the postmen there. Now, many towns and villages in Pennsylvania lie between Philadelphia and our post office, and it would be a great waste of time if all the letters had to be sent to the city and back again. But on each mail train there is a traveling post office. As the train rushes through the country the clerks in this post office are busy sorting letters from the great sacks into smaller bags. Some of the bags are meant for the small towns on the line; some of them are transferred to other trains on branch lines; some of them may even be made ready to send out on a route of the rural free delivery.

This work goes on ceaselessly on every

HOW THE MAIL TRAVELS

Photo, courtesy New York Central Railway.

As fast mail trains tear across the country there is no time to stop at all stations, but, nevertheless, mail is often taken on board when the train is going at full speed. The postmaster hangs the mail on a crane, as shown in our picture. As the train passes an iron arm gathers the bag into the car.

This is the interior of a mail car on a long run. This car carries mail for distant points, and here you see the clerks, who are employed by the Government, distributing it into proper sacks, which are held open before them. They almost never throw a piece into the wrong sack.

mail train that runs out of our cities. Town after town, village after village, receives its bag of letters from the tireless clerks on board the post office on wheels. Very often no stop is made. As the train comes to the station at almost full speed, a clerk standing at the side door of the car throws the locked mail bag to the platform, to be taken away by the man who is waiting there. This man brings with him the letters to be sent on the train; but as the train cannot stop, he hangs his bag on a crane set up in the station for that purpose. As the train passes, an iron arm shoots out from the open door, catches the bag, and gathers it into the car.

Not only letters, but newspapers, magazines, periodicals of all sorts are carried in mail bags on trains. Parcels, too, are carried by the mails. Produce from the farm may be sent to the city, and in return the city merchant may send his goods to the farmer. Large packages are not now put on the fast mail trains. They are sent on freight trains, because it has been found that it cost the railways too much to carry them on passenger trains.

WHAT IS MEANT BY RURAL FREE DELIVERY

Not very long ago letters were collected and delivered by postmen only in large places. Everywhere outside of the cities letters had to be taken to the post office by the writers and called for by the owners. Now, however, in many places we have what is called "rural free delivery." Mail-carriers drive, ride or motor through the country to collect the letters written and to leave those that have been brought into the office by the train or other conveyances. This system is a great convenience to dwellers in country places.

If we pay a few cents more than the ordinary postage rate for a letter or parcel the Government will register the letter or insure the parcel, and obtain a receipt from the person to whom it is delivered. In such a case, the letter or parcel may be traced unerringly from the beginning of its journey to the very end.

If we want to send a sum of money from one place to another the post office provides an easy and safe way of doing it. We hand in at the wicket at the post office the sum of money we want to send. The postal clerk makes out a money-order form for that amount and hands it to us. We pay a few cents for this convenient slip of paper which can be put into an envelope and sent off to its destination. We leave the station confident that the money will be paid to the person we have mentioned and that no one else can collect it.

The Government takes great precaution to protect all letters and parcels intrusted to the mails, and it makes its own locks to use on letter boxes, mail pouches and special strong boxes. That is not strange, but another form of precaution may surprise us. In many of the larger post offices cats are kept and fed at the public expense to prevent rats from eating our letters or parcels while in the big post offices. In the great public building at Washington, D. C., ferrets are also used for this purpose.

As we look round the great post office, of which we have been speaking, we think of all the places from which the letters come that pour into it every hour of the day. They have come from western ranches, from lonely mountain farms, from small hamlets, large towns, great cities. They have been carried on horseback, in mule wagons, in jitney busses, by train, in canoes, in river steamboats, by dog train, in great ocean liners and airplanes.

The United States Postal Service has an airplane mail service which will take a letter in New York and deliver it in Chicago in twelve hours or in San Francisco in less than thirty-six hours. The flight across country is made with just two stops, Chicago and Cheyenne. Very powerful searchlights have to be mounted on the postal flying fields so that night landings can be made. Other colored lights are used to mark the "air routes" and "air stations." For this quick delivery more postage has to be charged.

It costs only a few cents to send a letter from one part of the country to another; or from our own country to the other side of the world. Of course, if we had to pay the actual cost of sending our own letters, no one could write any letters at all. That is why the Government undertakes to send them for us. A few cents paid on each of many thousands of letters provides the cost of sending the huge masses of mail of which we have been thinking.

THE NEXT STORY OF FAMILIAR THINGS IS ON PAGE 2795.

PARCELS AND LETTERS IN THE POST OFFICE

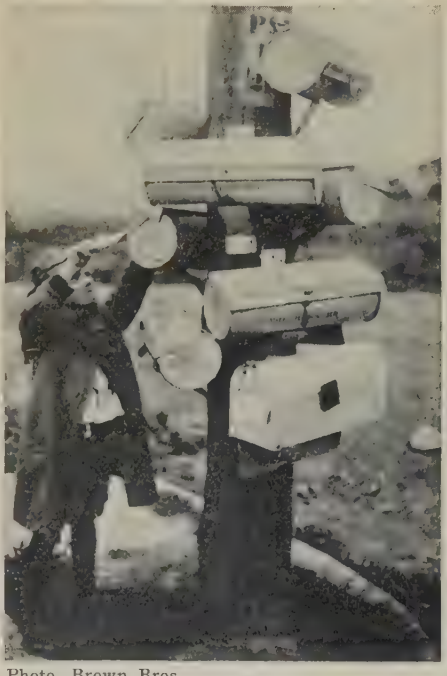
This picture shows the work of the men who sort parcels. If the picture were large enough, you could see that each of the slides is marked with the name of a state or of one of the large cities. At the back of each slide there is a wire door. When the receptacle is full, a man hooks a strong bag on the frame, opens the door, and the packages fall into the bag held ready for them.

These are the steel cylinders in which letters are sent between the general post office and the principal branch offices in some of our large cities. When a cylinder is full, it is locked, placed in a pneumatic tube and sent off on its journey in the way described on page 2656. Photos, copyright, Brown Bros.

RURAL FREE DELIVERY

Photo, Ewing Galloway.

Old "Dobbin" and a buggy were once used by rural mail-carriers to deliver letters and parcels to country people living where a Rural Free Delivery was in force. But this method has become old-fashioned.



Photo, Brown Bros.

Along Rural Free Delivery routes it is not uncommon to see from eight to twelve metal mail-receiving boxes fastened to a single post.

Photo, Ewing Galloway.

Automobiles are used in place of horses and buggies by most mail-carriers in rural districts. They have made possible morning delivery of papers to farmers.

MAIL DELIVERY BY WATER

On the Star Route between Ellison Bay and Detroit Harbor, Wisconsin, the mail-carrier has to deliver his precious cargo by water. Here we see the mail boat breaking its way through the ice.

A combination sailboat, rowboat, ice yacht and sled is used in winter to carry the mails between Sandusky and Put-in-Bay, Ohio. This is one of the strangest methods used by carriers.

The Post Office Department does not wait until steamers dock to get the mail from abroad, but sends special harbor mail boats to meet incoming mail steamers.

Photos, United States Post Office Department, Washington, D.C.

UNITED STATES AIR-MAIL SERVICE

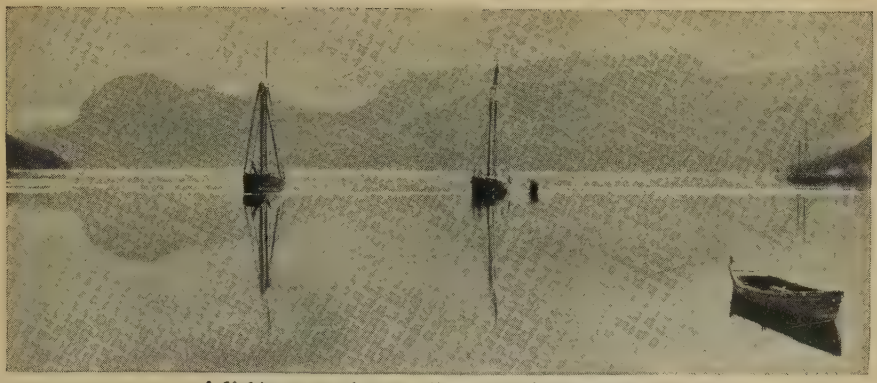
Here we see mail airplanes ready to leave Hazelhurst Field, Long Island, for Chicago on the first lap of the coast-to-coast air-mail service. A daily service is maintained between New York and San Francisco. Photo, Wide World.

The sacks of mail to be carried by air service are brought from the post office to the flying-field by automobile just in time to be put on board the aircraft as she is ready to "hop-off." Photo, Brown Bros.

Photos, Wide World.

Searchlights of tremendous strength are erected at flying-fields.

Aviation beacons light the night air lines.



A light summer haze on the coast of Newfoundland.

WHAT CLIMATE MEANS TO US

CONTINUED FROM 2542

THE question is sometimes asked, What is the difference between weather and climate? The answer is easy. The difference is much the same as the distinction between a Chinese and the Chinese nation. The nation derives its character from the character of the people who go to make it: and the Chinese nation is different from the French nation because individual Chinese are different from individual Frenchmen.

In the same way the climate of Italy is not like that of Scotland because, whatever the weather may be at any particular time, on the whole it is apt to be finer and warmer in Italy than in Scotland. It is the general tendency of the weather in any particular place which constitutes what is called its climate.

In times gone by great changes of climate have taken place. Many parts of Europe and of our country have been more than once covered with glacial ice; at other times these districts must have been much warmer than they now are, for we sometimes find portions of the skeletons of animals and the fossilized remains of vegetation which could certainly not have flourished except under semi-tropical conditions.

These changes of climate occurred many thousands or even millions of years ago, and it is possible that similar changes are going on now, though too slowly for us to be able to detect them. The few centuries of which we know anything definite about the history of the world, supply little, if any, evidence that any great change of climate has taken place.

The effect of climate on the history of the world has been very profound. Differences of climate make some districts fertile and healthful and others barren and inhospitable. Climate has thus been a great factor in determining what parts of the earth should be thickly populated, and consequently where great nations would grow up. More than this: not only has climate led men to prefer some regions to others, it has molded their very characters and physique.

The supremacy of the peoples of the temperate climates in all that makes for civilization and progress is a striking fact. The ease with which the needs of life can be procured in the tropics has helped to make many races indolent and unprogressive. Then, too, it is harder to do both mental and physical work in those regions. The mental development of the people has been retarded, and they have either stood still or slipped backward in the path of progress.

In the icy polar regions, on the

other hand, the task of winning food and shelter demands so much energy that little or none is left for their higher progress. The Eskimo is hardly more civilized than the African savage. Climate has been in one case too stern a taskmaster, in the other too indulgent a nurse.

A temperate climate neither weakens the moral fibre by making life too easy nor drains the physical energy by making life too hard. It tends to stimulate the body and brain and to produce both the desire for culture and the power to pursue it.

THE CONSTANT STREAM OF ENERGY POURED OUT BY THE SUN

Many different factors go to build up a climate, but two of them are far more important than any others. They are temperature and rainfall; and the whole general character of the climate of any place depends on them.

The earth, as we know, is a great ball of matter floating in space. It is one of the satellites of a still greater mass, the sun. In its present condition it is itself capable of producing extremely little energy or power to do work. In other words, it is giving off very little heat. But the sun is constantly pouring out a great stream of radiant energy. Only about one part in two thousand millions of this life-giving radiance of the sun falls to the share of our planet; but this tiny fraction supplies us with all the heat we require and a great deal to spare.

As it traverses the ninety-three million miles of space which separate the earth from the sun this energy is not heat; it becomes heat only when it strikes against physical matter. About half the radiant energy that comes our way is intercepted before it reaches the ground by the clouds and by the particles of dust which float in the air. They reflect it in the form of light and heat into the air itself. If this were not so, the warmth near the ground would be unbearable and the glare of sunlight intolerable to the eyes.

WHY THE AIR IS WARMER NEAR THE GROUND THAN UP ABOVE

The remaining half of the solar energy directed toward us spends itself in heating the solid crust of the earth and the vast expanses of water which lie on its surface. The heat does not penetrate more than a few feet below the surface of the soil, but in the case of water it reaches to greater depths. Much of this heat is used up in the chemical changes which accompany the growth of vegetation, and is by this means stored in the form either of fuel or of food. The remainder is reflected into the lower layers of the air. These lower layers thus get a double share of heat; and this is one of the reasons why the air near the ground is warmer than that at higher levels.

The amount of solar heat which is stored up by the ground or passed back into the air depends on the angle at which the sun's rays fall. This is because the same quantity of radiation has to heat a larger surface if it falls slantingly than if it falls vertically. Owing partly to the shape of the earth, the sun's rays fall nearly vertically in the neighborhood of the Equator and more and more aslant as we approach the North or South Pole. This fact helps to explain the origin of the word climate. It is derived from the Greek word *klima,* which simply means "slope." We now use the word climate in a broader sense.

The second important factor that influences the temperature is the height of the ground above the level of the sea. The higher up we go, the less heat do we find reflected into the air, and the effect of height is relatively much greater than that of distances from the Equator.

THE GREAT PART THE SEA PLAYS IN DISTRIBUTING HEAT

To find a difference of twenty degrees Fahrenheit in the average temperature we must travel about three thousand miles north or south of the Equator; but the same difference will be found if we travel *upward* by climbing a mountain or going up in a balloon to a height of only one mile. At the top of Mount Kilimanjaro, nearly twenty thousand feet high, but in nearly the hottest part of the world, it is colder than in Iceland, close to the Arctic Circle.

Of the surface of the earth only about one-quarter is land; the remaining three-quarters are water. This has a very important effect on the distribution of the heat derived from the sun. Water absorbs more heat than land, and gives this heat up to the air more slowly. The air over the sea is therefore cooler than that over the land during the time the sun is shining—that is, during the summer and in the daytime. In the winter and at night the air over the sea does not become so cold as that over the land.

THE GREAT WHITE PERIL ON THE SEA

An iceberg carried south by the cold current flowing past the coast of Newfoundland.

A waterspout in the Black Sea, caused by a whirlwind over the water.

This means that over the sea and the land close to it the change of temperature between summer and winter and day and night is not so great as over the continents. Sea climates are called maritime or equable; land climates are known as continental or extreme. Maritime climates are to be found in most small islands, which, therefore, have cool summers and mild winters. But in the interiors of great continental areas, like Siberia, the summer is very hot and the winter bitterly cold.

THE GREAT WIND STREAMS WHICH BLOW FROM THE EQUATOR

These facts explain why some parts of the earth are warm and others cold, and how the presence of water tends to moderate these differences. But besides water there is a great moderating influence which works in a different way. This is the air itself. Like water, the atmosphere is always busily trying to wipe out the inequalities of temperature, and it has properties which fit it in a remarkable manner for this task.

When air is heated it expands and begins to rise. Warm air is always trying to get up to higher levels. All round the Equator there is a constant ascent of hot air, while streams of cooler air are continually flowing in from both north and south to take its place.

These great streams blowing toward the Equator are known as the trade winds, trade meaning "regular" or "persistent." Because of the rotation of the earth the trade winds do not blow directly toward the Equator but rather in an easterly direction; so that in the northern hemisphere they are northeasterly and in the southern hemisphere southeasterly. The southwest anti-trades in the northern hemisphere, the northwest anti-trades in the southern hemisphere, the monsoons, and other winds affecting the climate of various parts of the world have their origin in similar causes.

THE IMPORTANCE OF TRADE WINDS IN CARRYING HEAT AND RAIN

The climate of the world depends mainly on the trade winds, carrying cool air toward the Equator, and the anti-trades, carrying warm air toward the Poles. The British Isles lie in the track of the northern anti-trades, and the climate, especially in the west, owes its dampness and mildness almost entirely to this cause, though it is also modified by the current of warm water known as the Gulf Stream.

The circulation of the atmosphere in the form of wind is really a wonderfully efficient means of distributing heat over the surface of the earth. In addition to its effect in causing ocean currents, wind is also the agent by which water is distributed in the form of rain. After temperature, rainfall is the next great factor of climate. To all forms of life, both animal and vegetable, water is in some way absolutely necessary, and therefore the distribution of rainfall is of the utmost importance.

The circulation of fresh water over the globe depends upon its property of existing not only in a liquid state but in the form of vapor. Wherever there is air in a free state it contains a certain quantity of water-vapor, and water-surfaces exposed to the air are constantly giving off vapor. This vapor is passing into the air, and wherever the air moves as wind it carries the vapor with it.

Now the amount of water-vapor which the air can carry depends on the temperature. Warm air can contain more than cool air. If air containing water-vapor is cooled, the vapor will condense into liquid water, which will take the form of mist or clouds and may afterward fall in the form of rain.

THE GIRDLE OF PERPETUAL RAINS THAT SURROUNDS THE WORLD

The main cause of this condensation of water-vapor in the form of rain is the ascent of damp air. Anything that causes air to rise will, if it goes on long enough, eventually cause rain. All around the zone of tropical calms near the Equator air is constantly moving upward. Consequently in this region there is a girdle of perpetual rains surrounding the globe, and the total rainfall is enormous.

In the trade-wind belts where there is no ascent of warm air there is usually very little rainfall. The sky is nearly always blue, and the weather serene and fine. In those regions lie nearly all the great deserts of the globe. A vast tract of nearly waterless land in the northern hemisphere stretches from the arid Sahara across the heat-parched plains of Arabia and Mesopotamia into the dreary deserts of central Asia.

In the southern hemisphere the greater part of the dry belt lies over the sea, but

it includes the Kalahari Desert in South Africa, the great Australian drought areas, and the wastes of Patagonia. It is probable that, owing to lack of water, most of these rainless districts will always be unable to support large populations.

The belts where the anti-trades blow are regions of intermittent rainfall; they have neither the constant rains of the equatorial belt nor the terrible droughts of the subtropical dry zone. For the most part the rains of the temperate zones which lie wholly within the anti-trade wind regions are not very heavy; they are fairly evenly distributed throughout the year. The climates of northwestern Europe and of New Zealand, where rain falls at all seasons but always in moderation, are of this kind.

WHY RAINFALL IS USUALLY HEAVIER WHERE THERE ARE MOUNTAINS

Except in the tropics, and even there to a certain extent, the amount of rainfall depends largely upon the presence of mountains. When moist winds blow against the slopes of hills their passage is obstructed and the air is forced to ascend. Mountain ranges lying in the path of sea winds are therefore very rainy, while the country beyond them is robbed of its share of rain, and is drier than it would otherwise be. Thus the Southern Andes in South America, lying in the track of the northwest anti-trades of the northern hemisphere, and the mountains of California and British Columbia in the path of the southwesterlies, are regions of extremely heavy rainfall. The English Lake District and the Scottish Highlands owe their wetness to the same cause, while the east coasts of England and Scotland are notably dry.

The rainfall of India is heaviest where mountain ranges like the Western Ghats and the Himalayas lie across the path of the northwest monsoon. In parts of Assam as much as 400 or 500 inches of rain falls in a year, and as much as 40 inches has been known to fall in a single day, or nearly double the yearly rainfall ever recorded in London.

THE TREMENDOUS INFLUENCE OF CLIMATE ON MEN AND NATIONS

The high mountains of the interior of Tibet do not cause heavy rainfall because the sea winds have been drained of their moisture before they penetrate so far inland. The interior of the continent of Asia is thus nearly rainless at all seasons, in spite of its great elevation.

In course of time races that live in very hot or very cold countries have become accustomed to conditions which others could not endure. The negro, whose environment has accustomed him to tropical suns, sickens in the chill winds of Europe; the Laplander, hardened by centuries of exposure to Arctic blizzards, would find the European climate enervating. The white man can live in the tropics only by taking constant precautions against disease, or by dwelling in the hills, where the climate is more like that of his own land.

The climatic circumstances which have most effect on the conditions of life are temperature and rainfall. This, however, is not so much that they have most to do with comfort, but because on them depends to a large extent the productiveness of the soil.

Of the two, rainfall is the more vital. Except in a few cases of great mineral wealth, or where conditions are favorable for manufacturing work, the only districts that can support a large population without adequate rainfall are those which are watered by rivers carrying the rainfall of some other region. Thus Egypt is watered by the Nile, which brings down the rains of Abyssinia and is well peopled, while the Libyan Desert and the Nubian Desert on either side are arid and waterless. The greater part of the land area in the trade-wind belts of scanty rainfall is barren and has little animal or vegetable life. Much of it consists of great sandy wastes with a meagre growth of cactus and occasional stunted thorn trees.

THE FIVE BELTS OF VEGETATION BETWEEN THE EQUATOR AND THE POLES

The snow-deserts of the polar regions are the only other large and completely infertile tracts on the surface of the globe. Here Nature at her grimmest reigns supreme; life, under such conditions, offers few attractions, and for the most part is possible only quite close to the sea.

Roughly, vegetable life can be divided up into five groups. The first group is confined to the tropics, and requires constant warmth and abundant rain. In it are sugar, coffee and the banana. The second group also requires warmth, but flourishes with much less moisture. These are the plants of the desert or sub-desert districts, such as the cactus, date and

eucalyptus. They are usually taper-rooted, so that they may reach down to deep-seated supplies of moisture, while their leaves are small, thick and horny, offering little opportunity for evaporation.

The third great botanical group includes the plants whose preference is for moderation in both temperature and moisture. Among these is much of the most important produce of the world, and most of the vegetation of the temperate and sub-tropical zones. They vary from cotton, rice and tea in the warmer and damper climates, to wheat and the ordinary orchard fruits of drier and cooler climates.

THE STORY WRITTEN IN THE PLANTS ON MOUNTAIN SLOPES

The fourth group needs still less heat but a fair rainfall, and is not injured by snow. This includes the hardier grains and fruits, fir and pine trees, and birches. Toward the Arctic regions even this limited range of vegetation fades away into the fifth and last group. No trees are able to find a footing in the snow-coasts, and the only forms of plant life are lichens and mosses, though scanty crops of barley and potatoes are occasionally grown, but only near the sea.

In traveling from the tropics to the Poles one might expect to pass in turn through all these gradations. This is not quite true, for it must be remembered that in any individual place where the climate depends primarily on the distance from the Equator, it is very greatly modified by altitude and nearness to the sea.

In the tropical zone the traveler climbing the slopes of a high mountain will pass through the same series of changes of plant life as if he made the long journey to the Arctic. At a height of 5,000 or 6,000 feet he will see a landscape such as he might find around the Great Lakes; at 10,000 feet he will be among the pines of northern Canada; and at 15,000 feet vegetation will be almost as extinct as on the ice-cap of Greenland. In much the same way in the journey from the tropical rain-belts of Lower Nigeria to the rainless deserts of the Sudan, one would leave behind the most luxurious and abundant plant life and pass gradually into a treeless waste.

In the monsoon regions we have examples of these contrasts existing in one and the same place. Over much of India and southern Asia during the dry season the soil is baked, and no amount of work will bring any return. The weary farmer watches anxiously for the first sign of the summer rains. When they come the land is transformed as if by magic from a desert to a fertile garden.

THE INFLUENCE OF CLIMATE ON INDUSTRY AND PROGRESS

The climate of any part of the world is likely to decide the industries which will prevail. In order that the fruits of industry may be available for all a vast system of interchange has grown up. England, for example, does not, and cannot economically, produce sufficient foodstuffs to feed her teeming millions; while Canada and Australia grow very much more than they can consume. England cannot grow cotton, but can manufacture it; she imports millions of bales every year, most of which is spun into cloth and exported. On the other hand, the United States has such a variety of soil and climate that she could almost do without the remainder of the world.

The temperate climates have induced the most vigorous mental and physical development. This development has created a demand for the produce of all the world, most of which they cannot themselves grow. It is this need which led the progressive nations to send their trading ships to all quarters of the globe, and in time to establish settlements.

MAN'S SLOW TRIUMPH OVER THE GREAT OBSTACLES OF NATURE

There are many ways in which the vast forces of nature control the life of man, and climate is an example of this domination. One of the greatest tasks which civilization is slowly performing in the world is the subjugation of natural forces. Man is meant to be a master, not a slave. Every advance in material progress, if wisely used, should free him more completely from any disadvantages which climate sets for him.

Man long ago learned to protect himself from heat and cold, sun and storm, by clothing and shelter. In many ways he has conquered the immense difficulties of living and traveling in climates beyond his natural range of endurance. He has drained swamps and carried water into deserts. Above all, he can learn nobly to endure discomforts and privations, and thus make the very obstacles with which nature opposes him a source of strength.

THE NEXT STORY OF THE EARTH IS ON PAGE 2791.

The sky-line of New York, showing the height of some of its wonderful buildings.

THE UNITED NATION

PART I

WE told in our last story of the quarrels between President Johnson and Congress, and of the failure of the attempt to drive the president from his high office. As the end of his term drew near, it was certain that the Republican party would nominate General Grant for the presidency. This was done, and he was elected by a great majority in 1868 and re-elected in 1872.

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Eight of the seceding states had been restored to the Union during Johnson's administration, but one of them, Georgia, had been put back under military rule. In 1870 this state and Virginia, Mississippi and Texas were all recognized as members of the Union. All the states were now in the Union, but conditions in some of the southern states remained very bad for many years longer.

The Fifteenth Amendment, which forbade the states to deny negroes the right to vote, became a part of the Constitution during President Grant's first term, and some of the railroads across the continent were finished. Population in the West increased very rapidly as the railroads were pushed across the plains. The government gave 160 acres of land to every farmer who would live upon it for five years. In 1873 there came a period of hard times, during which many banks and manufacturing establishments failed, and business was very dull. In this year the government ceased coining silver dollars. Later in the administration the Indians in the West made much trouble.

One of the most important events of the time was the Centennial Exposition at Philadelphia in 1876, to mark the century since the Declaration of Independence. It was the first of the great expositions held in the United States, and the exhibits from our own country and from Europe were finer than had ever been seen. People from all parts of the country attended, and saw many things of which they had only heard before.

A DISPUTED ELECTION CAUSES GREAT ALARM

At the election of 1876 both the Democratic candidate, Samuel J. Tilden, of New York, and the Republican, Rutherford B. Hayes, of Ohio, claimed to have been chosen. It was very hard

to know who had been really elected. In two of the southern states there were two governments, each claiming to be the right one. In other states there were many charges of fraud, and many laws had not been obeyed. The time for the new president to take office was coming and no one could say which of the two candidates was entitled to the office. So a special court, called an Electoral Commission, was formed and decided in favor of Hayes, who took his seat, but many people believe to this day that Tilden was rightfully elected.

During this administration the United States soldiers were called back from the southern states, which were allowed to govern themselves. As soon as the soldiers were gone the "carpetbaggers" and negroes lost all power. The Bland-Allison act was passed compelling the treasury to buy a certain amount of silver every month and coin it into dollars.

Though President Hayes was in many ways a good president, the charge that the office really did not belong to him had some effect on his popularity. In 1880 another Ohio man was nominated by the Republicans, though many people had tried to get a third nomination for General Grant. The Democrats nominated General W. S. Hancock, but the Republican candidate was elected. The new president, James A. Garfield, had been a poor boy who had struggled hard for an education. Once he drove the teams which pulled the boats on the Ohio Canal, and afterward worked his way through school and college.

President Garfield had been in office only a few months when he was shot by a man who had become half-insane because of disappointment at not receiving an office. Vice-President Chester A. Arthur, of New York, became president and served the remainder of the term. He was a good president, and the country was very prosperous while he was in office, though little of importance happened.

THE FIRST DEMOCRATIC PRESIDENT SINCE THE WAR

At the election in 1884 Grover Cleveland, then governor of New York, was chosen over the Republican candidate, James G. Blaine, of Maine. President Cleveland was the first Democratic president since James Buchanan. For twenty-four years every president had been a Republican. But the Democratic party did not have entire control of the government, as during the whole four years a majority of the senators were Republicans. During this term there were great strikes in different parts of the country. A "strike" is the refusal of men to work longer for their employer. The railway strike in Chicago was so serious that President Cleveland called out United States soldiers to protect the mails.

After the end of the Civil War the wooden ships of the navy had been allowed to rot, and the monitors, as all the iron ships were called after the first one, had rusted away. The country had no navy worth mentioning when Cleveland became president. During his term we began to build modern warships and have continued, until now our navy is one of the strongest in the world.

Mr. Cleveland favored a much lower tariff on goods coming into the country. He was again a candidate in 1888, but was defeated by Benjamin Harrison, of Indiana, a grandson of President William Henry Harrison. The tariff was greatly increased during his administration and six new states were admitted to the Union. There was much talk about coining still more silver into dollars, and a law was passed in 1890 which allowed this.

Though President Harrison was a man of great ability, he did not make friends easily and was not very popular with his own party. He was a candidate for re-election in 1892, but Cleveland was again elected. He is the only president in our history who has served two terms not in succession.

A GREAT EXPOSITION HELD IN CHICAGO

A celebration of the four hundredth year since the discovery of America by Columbus took place in Chicago in 1893, as the buildings could not be gotten ready in 1892. This World's Fair, as it was called, was the most wonderful collection of the manufactures and products of the world that had ever been seen up to that time.

Times were very bad during President Cleveland's second term, and there were many strikes. The farmers in the South and West thought that the laws were more favorable to the manufacturers than to those who worked on the land, and demanded many new laws. They had formed a new party known as the People's

MAKING THE DESERT BLOSSOM

Here we see the wonderful results of the energy of the people of the great West. In their advance across a vast continent they came to arid deserts like that in the top picture, on which rain rarely falls. They set to work, however, bored wells, and dug waterways to fetch water from the distant mountains and rivers. This water they guided into a vast network of irrigation channels, and made the desert soil so fertile that to-day, after forty years, we see such luxuriant orange groves as in the bottom picture. In the centre picture we see water flowing from a well into an irrigation channel, and so the want of rain does not matter at all to these busy people.

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party, though it is usually called by the name Populist. They had had a candidate for president in 1892, and grew in strength during Cleveland's second administration. His own party did not support President Cleveland, and nominated William J. Bryan, of Nebraska, who received the support of the Populist party also.

When the election arrived the Republican candidate, William McKinley, another Ohio man, was chosen. The most important event of his administration was the Spanish American War, in which Cuba was freed from Spain. The United States added Hawaii and the Philippine Islands to its territory across the seas. President McKinley was re-elected in 1900, but only a few months after his second term began, he was shot by an anarchist while in Buffalo, New York, attending another exposition, and soon died.

The vice-president, Theodore Roosevelt, became president and finished the term, and was himself elected for a full term in 1904. Mr. Roosevelt was one of the most active presidents the country has ever had. He started the work on the Panama Canal, had a pure food and drug law passed, and did much to bring water to the dry lands in the West. Through his influence Japan and Russia agreed to stop fighting. When the Cubans began to quarrel among themselves he sent an army to preserve order. He visited all parts of the country to make speeches, went to see how the work was being done on the Panama Canal, and took great interest in everything. At the end of his term he spent more than a year hunting in Africa and told of his adventures in a large book.

OHIO, THE NEW "MOTHER OF THE PRESIDENTS"

Mr. Roosevelt was succeeded by William H. Taft, of Ohio. That state seems to be likely to take away the title, "Mother of the Presidents," from Virginia, as so many of our recent presidents have been elected from Ohio. Mr. Taft had had much experience in government. He was the first governor of the Philippines, served as Secretary of War, and when the United States sent the second army to Cuba, took charge of the government until the island was quiet again.

President Taft did not have a happy time as president. The Republican party was divided on the tariff and other questions, and the President could not please either division of his party. When Ex-President Roosevelt came back from Africa he began to take great interest in politics and tried to get the Republican nomination instead of President Taft, in 1912. He failed, and his friends organized the new Progressive party and nominated him for president. The old friends now opposed each other and divided the Republican party so that the Democratic candidate was chosen. President Taft became professor of law in Yale University and was later appointed Chief Justice of the Supreme Court by President Harding.

THE UNITED STATES IN OUR OWN DAY

In the election of 1912 Woodrow Wilson, governor of New Jersey, was chosen, and was inaugurated March 4, 1913. President Wilson had been a college professor and was president of Princeton University when he was chosen governor of New Jersey. Like President Cleveland, he had very little political experience, but Congress passed many bills he recommended.

During President Wilson's first term, for he was re-elected in 1916, a new tariff bill was passed, and many changes were made in the laws about money and banking. The Panama Canal was completed; and we almost had a war with Mexico as that country was in a state of revolution and American citizens were abused and even killed.

THE UNITED STATES ENTERS THE WORLD WAR

The World War in Europe broke out, and though President Wilson succeeded in keeping the United States out of the conflict for more than two years, war was declared against the German Empire April 6, 1917, and later against the Austrian Empire. During this year three small islands in the West Indies, St. Thomas, St. Croix and St. John, were bought from Denmark for $25,000,000.

Many men were called to enter the army and navy, and very soon uniforms were seen in every town and city. Real cities were built to shelter the soldiers while they were drilling before going across the ocean. American naval vessels soon went across the water to hunt submarines, or to guard the ships carrying soldiers or food and military supplies. Two million men went across the ocean,

LOOKING DOWN A NEW YORK STREET

New York, chief port of the United States, is built on a narrow island. This means that as the city grew there was not as much room as people needed for building. So, instead of spreading buildings over the ground, they have been built high in the air, until the business part of New York is now largely a city of "skyscrapers," as we usually call them. Broadway, shown in this picture, is one of the principal streets in New York, and is like no other street in the world. A great part of it is like a deep ravine, lined on each side with buildings from ten to more than thirty stories high.

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and as many more were ready to go when the Germans asked for peace in 1918.

There was also work for those who stayed home. Larger crops than ever must be raised with fewer workers. Great efforts were made to build merchant ships as well as vessels for the navy. In many industries more goods were needed than in times of peace. At the same time great sums were raised for the Red Cross and for various organizations which looked after the welfare of soldiers or their families.

President Wilson was a strong advocate of a League of Nations and attended the Peace Conference in Paris to work for the idea. Many men did not wish the United States to join any such organization as the League of Nations, and the President's ill-health caused some confusion. Finally the Senate refused to ratify the Treaty of Versailles, because it provided for entrance to the League. In the election in 1920 the Republican candidate, Senator Warren G. Harding, was chosen the twenty-eighth president by a large majority over James M. Cox, also of Ohio.

THE ADMINISTRATION OF PRESIDENTS HARDING AND COOLIDGE

President Harding was a man who made many friends, and was not always able to refuse their requests. For this reason some of his appointments were not the best that could have been made. Some officials seemed to forget the interests of the United States and favored private business.

Perhaps the most important event of the administration was the Conference on Limitation of Armament called to meet in Washington in 1921. It was attended by delegates from the leading powers, who agreed upon a plan to reduce the navies of the world.

A separate peace was made with the German state, and though the United States refused to join the League, unofficial representatives took a part in settling many questions growing out of the war. A new tariff act was passed, and also laws limiting the number of immigrants allowed to enter the country. While a number of questions growing out of the war were still unsettled President Harding died, in San Francisco, August 2, 1923. He was returning from a trip to Alaska at the time.

Calvin Coolidge, vice-president, became president for the unexpired term. An accidental president has a difficult task. He must learn how to get along with the men appointed by his predecessor, and also must learn to work with Congress. The most important act passed was the law restricting immigration still further, and shutting out all immigrants of the yellow races, who are not allowed to become citizens.

At the election of 1924 President Coolidge was chosen for a full term over John W. Davis of West Virginia, Democrat, and Robert M. LaFollette of Wisconsin, Independent. President Coolidge was the second native of Vermont to be elected president, though most of his life had been spent in Massachusetts. He was governor of that state when elected vice-president and had been lieutenant-governor.

The United States is really growing into middle age. Whether the nation will grow much larger in territory no one can say. Years ago many people in both countries thought that Canada would some day be joined to the United States, but little is heard of the idea now. Some have dreamed of extending the country down to the Panama Canal, but most of the citizens think that the plan would be very unwise.

VICE-PRESIDENTS WHO SUCCEEDED TO THE OFFICE OF PRESIDENT

Though twenty-nine men have been president, only twenty-five were elected to the office. Six vice-presidents have become presidents because of the death of the man elected. These were John Tyler, who succeeded William Henry Harrison after only one month of the term had gone; Millard Fillmore, who succeeded General Taylor; Andrew Johnson, who filled out the greater part of Lincoln's second term; Chester A. Arthur, who succeeded Garfield; Theodore Roosevelt, who served nearly three and a half years of McKinley's second term; and Calvin Coolidge, who served nineteen months of President Harding's term. Roosevelt and Coolidge are the only ones of these who were afterward elected to the office.

One fact which we must consider with shame is that three of our presidents were assassinated within a period of less than forty years. It seems horrible that such a thing should occur in a free country,

TWO THRIVING WESTERN CITIES

Portland, Oregon, is a western city which has grown like magic. It is beautifully located at the point where the Willamette River joins the Columbia. It has an excellent harbor which will accommodate the large ships that come to take away some of the many things manufactured in the busy city. The railroad connections are excellent. This is the Broadway bridge over the Willamette, raised to let a ship pass.

The city of Reno, Nevada, is situated on the Truckee River and is the largest town in the state. It is also the educational, business and industrial centre. The University of Nevada is here, and several other schools. There is considerable manufacturing, and the country around is rich in minerals. Much of the land is irrigated and produces large crops. Many cattle are also raised. It has several railroads.

where everyone has a voice in the government, and where there is no chance of a president's becoming a tyrant.

Of all our presidents ten have been twice elected, though Lincoln and McKinley did not fill out their second terms. Cleveland was elected, then defeated, and then elected again.

WHERE OUR PRESIDENTS LIVED

All of our presidents were born east of the Mississippi River, and most of them have come from a few states. Five came from Virginia. These were Washington, Jefferson, Madison, Monroe and Tyler, but three others, William Henry Harrison, Zachary Taylor and Woodrow Wilson, were born there. Ohio has furnished six: W. H. Harrison, Hayes, Garfield, McKinley, Taft and Harding. All these except W. H. Harrison were born in the state; and Grant and Benjamin Harrison, though elected from other states, were born in Ohio. Five lived in New York: Van Buren, Fillmore, Arthur, Cleveland and Roosevelt; but Arthur was born in Vermont, and Cleveland in New Jersey. Three lived in Tennessee: Jackson, Polk and Johnson; but all of them were born in North Carolina. Massachusetts has had three: John Adams and John Quincy Adams, father and son, and Coolidge. Illinois has had two: Lincoln and Grant; but Lincoln was born in Kentucky, and Grant, as we said above, in Ohio. Louisiana had one, Taylor; New Hampshire had Pierce; and Pennsylvania had Buchanan. Indiana was the home of Benjamin Harrison, and New Jersey of Woodrow Wilson.

The West is growing so rapidly in population, wealth and influence that before many years we may expect to see a president elected from the region beyond the Mississippi, and perhaps one from west of the Rocky Mountains.

SOME FACTS ABOUT THIS COUNTRY OF OURS

We have now told something of the story of our country. Now let us look about us and learn something of the country itself, the people and the products of the country. We know that the population is very great, and we shall try to find out where the people live and how they make their living.

Not counting our foreign possessions, the United States proper extends over more than three million square miles. This means that the United States is larger than all the countries of Europe taken together except Russia. Several single states are larger than most of the countries of Europe, and Texas is larger than any of them except Russia.

In addition, we must count Alaska, nearly 591,000 square miles; the Philippines with 115,000; Hawaii, 6,449; Porto Rico, 3,435; and many smaller islands in many seas. In all, the outlying territory of the United States amounts to nearly 717,000 square miles.

Every ten years the government takes the census. The number, residences and occupations of the people, their religion, the kinds of property they own, the crops they have raised, the goods they have made, and many other things are all put down and afterward published in large volumes. From them we can learn many interesting things, for figures are not dull if we understand what they mean.

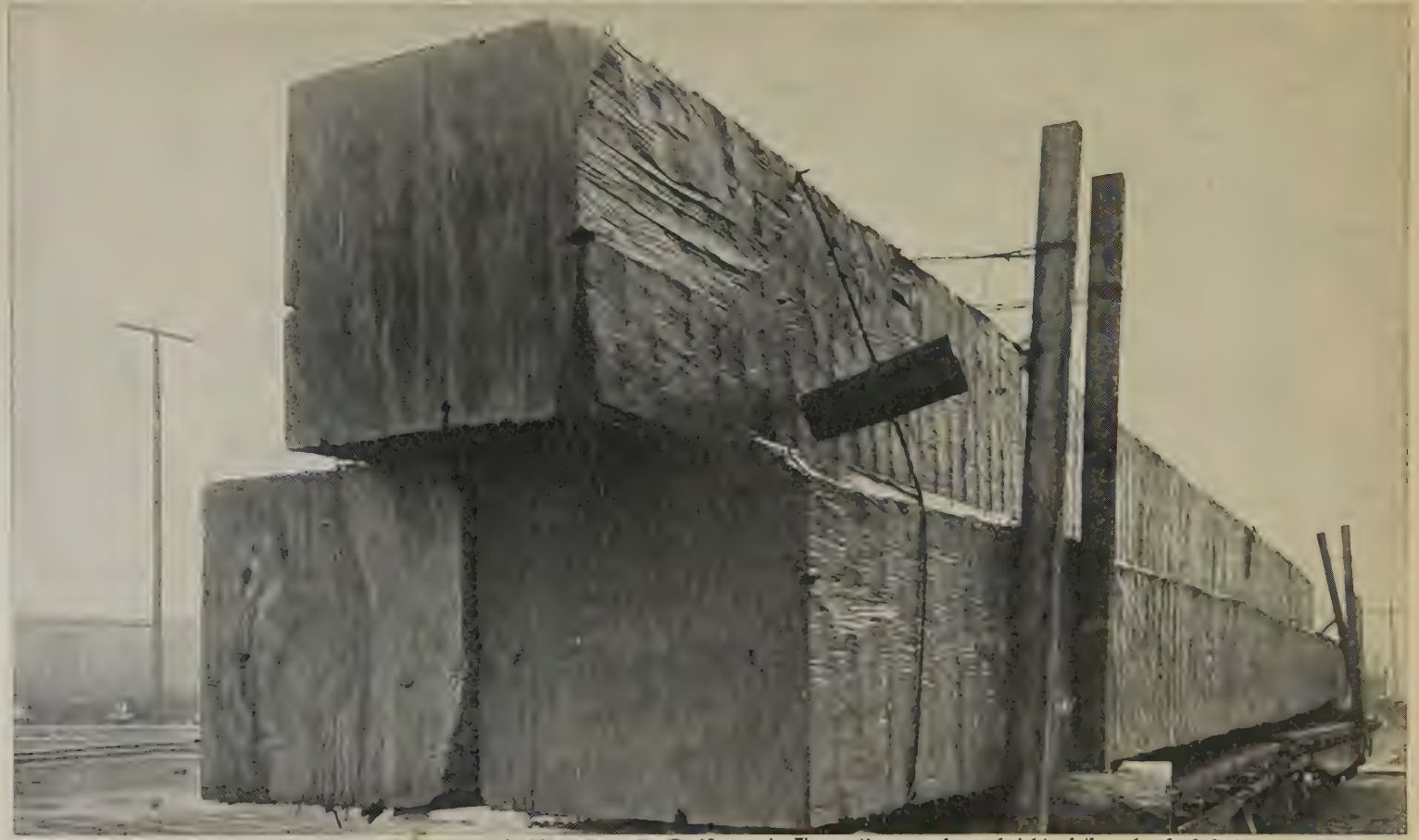
WHAT THE CENSUS SHOWS OF THE GROWTH OF OUR COUNTRY

The census of 1920 showed that there were living in the United States proper, on January 1 of that year, 105,710,620 people. If to these we add the population of Alaska and our island possessions, the number was nearly 118,000,000. The first census was taken in 1790, a hundred and thirty years before that of 1920. Then the population was under 4,000,000. This shows a wonderful growth.

The state with the largest population is, as might be supposed, New York, which had 10,385,227—a larger number than many nations have. Pennsylvania was next with 8,720,017, an increase of over a million in ten years. The state with the smallest population is Nevada, which had only 81,875 people in 1910, and ten years later only 77,407. Because of its scanty population this state should not have been admitted when it was. Much land in this state is not suitable for agriculture, but irrigation is making some of it fertile, and the state may yet support a much larger population.

The largest city is New York, with 4,800,000 people in 1910, and 5,620,048 in 1920, which makes it the largest city under one government in the world. Chicago had 2,701,705, and Philadelphia, with 1,823,779, ranks next in size; and these three are among the ten largest cities in the world. Nine other cities had over a half-million people each.

LOGS OF THE DOUGLAS FIR ON THE WAY TO THE MILL



The Douglas fir, or Douglas spruce, is one of the most valuable trees on the Pacific coast. It sometimes reaches a height of three hundred feet, and a diameter of from ten to twelve feet. The timber has a straight grain and is very strong. Many trees are cut every year. Here you see logs on railway cars on their way to the mills.

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VARIETIES OF SOIL AND CLIMATE IN THE UNITED STATES

Within the United States is almost every kind of soil and climate. On the rocky hillsides in Maine and New Hampshire very small crops are raised, while the broad prairies of the Mississippi Valley, and the lowlands along the seacoast and rivers have some of the richest land in the world. Somewhere in the vast extent is soil and climate which suits almost every crop.

In the most northern sections the winters are long and the summers short, and only the crops which grow very rapidly can be raised. In the far South—in Florida, Louisiana, Texas and Southern California—it seems always summer. In some parts of the country there is almost constant rain during some months of the year. In other parts rain seldom falls.

There are real deserts to be found, though they produce good crops when water is furnished. In other parts much land has been reclaimed from the sea or from the rivers, just as we know has been done in Holland and Belgium. Much land along the lower part of the Mississippi, and the rivers which flow into it, is lower than the river, and great banks of earth called levees keep the water back from the land.

CORN, THE MOST VALUABLE CROP WE RAISE

Corn is the most valuable crop produced in the United States. We grow two-thirds of the world's supply of this wonderful grain, which is so valuable for human food, as well as for horses, cattle and hogs. The dry stalks also make valuable food for horses and cattle. While still green the stalks and leaves are often chopped into short pieces and packed tightly in a great tank called a silo. The moisture does not dry out of the pieces, and animals like this ensilage, or silage, as it is often called, much better than dry food. There is no more beautiful sight than a great field of waving corn.

Corn will grow in nearly every part of the United States, but the states of the Middle West grow most, though the largest crop ever grown upon a single acre was produced by a member of a Boys' Corn Club in South Carolina. Many boys in the United States are members of such clubs, and try to raise as many bushels as possible.

The next crop in value in most years is hay, though little of this is sent abroad. Many grasses are dried to make this crop. Some grow wild without care, and what is gained from them is almost entirely profit. In other sections the seed is sown, though not every year. Several kinds of clover, timothy, red top, orchard grass, blue grass and alfalfa are some of the plants used for hay. The vines of several sorts of peas and beans make good hay when cured properly.

COTTON, A CROP WHICH THE WORLD MUST HAVE

The crop for which the world is most dependent upon us is cotton. In no other country can cotton be grown so easily as in our southern states, and though we have many busy factories, both in the North and in the South, about half of the crop is sent abroad. Egypt and India also grow cotton, but there is not land enough in Egypt, and in India the climate does not allow the best kinds to grow. If a machine to pick the cotton in the fields could be invented, the United States could easily supply the whole world. In recent years an insect pest, the boll-weevil, has done much damage to the crop.

Other nations have tried to develop cotton-growing in different parts of South America, Asia and Africa, but have not succeeded very well. Soil, climate and labor must all be suited to the plant, and all these are seldom found together. The United States will be the chief cotton-growing country for a long time. The sea-island cotton, which has very long fibres which are almost as fine as silk, used to be grown, but has been almost destroyed by the boll-weevil. Small quantities of a similar kind are grown on irrigated land in the Southwest.

MILLIONS OF DOLLARS ONCE THROWN AWAY

Only a few years ago the seeds of the cotton were considered a great nuisance and were thrown away. Now they are ground, the oil is pressed out, and what is left is used for a fertilizer or for food for cattle. The hulls also are fed to cattle. The oil is used for many purposes, and some dealers put false labels on the bottles and sell the contents as olive oil. Altogether the value of the products of the cotton seed, once thrown away, amount to more than $500,000,000 a year.

Our next crop in value is wheat, of which we usually grow a fourth or a fifth of all grown in the world. Some wheat

is grown in most of the states, but it is in the newer states of the gulf slope, of which you were told in Volume One, that the largest fields are to be found. We have been using about four-fifths of our crop ourselves and sending the remainder to help feed hungry Europe, but if our population continues to increase so rapidly, we shall not have much to spare before many more years have gone. Great wheat-fields are being developed in Canada and in the Argentine Republic, however. During the World War we raised and shipped much more than usual.

The United States grows more wheat than any other single country because so much land is devoted to wheat. The European countries generally grow more bushels to an acre, but they cannot plant so many acres. In some states wheat is sown in the fall and is ripe in the early summer. In other states it is sown in the spring and is reaped in the late summer or early fall. The weather has much to do with the size of the crop, and the same state is seldom ahead many years.

The apples grown in the valley of the Hood River, in Oregon, have made the district known everywhere. This is an apple orchard in full bloom and is a sight worth going miles to see. Delicious pears and strawberries are also grown. A ring of mountains surrounds the little valley, and Mount Hood is not far away.

Other Important Crops Grown in Our Country

Our next important crop is oats, of which we grow a great quantity. Perhaps you have oatmeal for breakfast every morning, but the horses get much more than you do.

The next crop is also one not much of which is sent abroad. This is the white, or Irish, potato, and the crop is worth hundreds of millions of dollars a year. We also grow great quantities of sweet potatoes, but they are nearly all eaten in this country. The white potato is grown chiefly in northern states and the sweet potato in the South.

The next crop in value is one with which boys and girls have nothing to do. This is tobacco, of which we grow about a third of the world's supply. Some of the factories which prepare this plant are very large and employ thousands of men, women and children. This is a luxury, but it is one men will go without many necessities to obtain, and the demand is regular and steady.

Next we come to sugar. We use more sugar than any other people—between eighty and ninety pounds a year for every man, woman and child. We cannot begin to raise all we need, though we grow sugar-cane in the South, sugar-beets farther north, and get a little maple-sugar from several states. We get much sugar from Cuba, Hawaii and the Philippines, and usually get some from Europe.

These are only a few of the crops we raise, but they are the principal ones. We raise in the southern states almost all the rice we use, and the amount of flax raised for its seeds is large. Linseed oil, used in painting, is made from flax seeds. We grow rye, barley, buckwheat and many kinds of fruit and vegetables. In California and Florida, oranges, pine-apples and other tropical fruits are grown, while apples, peaches and pears grow in many parts of the country. We are beginning to send some of our fruits abroad, as it is possible, by packing them in ice, to deliver them in good order thousands of miles away. California leads in the value of its fruits, with New York next. Michigan and Pennsylvania also grow large quantities. Florida is second to California in tropical fruits.

One important crop which we almost omitted

There is another crop which we must mention. Probably you have never considered it a crop at all, but it is as truly a crop as hay. The chief difference is that it takes longer to grow. The crop is trees, and the product is wood, or lumber. Land will yield a crop of hay every year, or perhaps several crops. A crop of trees takes twenty, forty, a hundred years to grow. Both hay and trees grow wild, and both are also cultivated.

When our ancestors came to this country much of it was covered with trees. The earliest descriptions and pictures of Manhattan Island show us that it was once covered with a great forest. So was most of New England, and the whole Atlantic slope, in fact. A part of the Mississippi Valley had no trees, but was covered with waving grass. This is the prairie region, of which you have heard, and there are more trees in it now than there were a hundred years ago. There were, however, great forests about the Great Lakes, in the Rocky Mountains, and on the Pacific coast.

It is very unpleasant to hear how these great forests were cut down and how much of the wood was wasted, because people thought there was enough to last forever. We are even now cutting down our trees more than three times as fast as they grow, and soon they will be gone unless men plant trees in great numbers. Think what uses we make of trees and their products, and you will see how difficult it will be to find something to take the place of wood.

We use wood to burn, to build houses, for furniture, for railway ties, for bridges, for boxes, pails and other containers, for vehicles. In fact, we cannot name all the things that are made of wood. The trees from thousands of acres are required by the paper-mills alone every year. In fact, we have cut down so many of the trees suitable for making paper that we must now get much of our pulp and paper from Canada.

Fortunately the country is becoming aroused. It is quite possible to treat a forest just as one would an orchard. When fruit is ripe it is picked. A tree has a period of growth, a period of maturity (ripeness) and a period of old age or decay. If only the "ripe" trees are cut and new ones are planted if they do not come up of themselves, a forest can go on producing timber forever. Much land is fit for nothing else but forest, but can grow trees profitably.

The value of the timber products of the state of Washington is greater than that of any other state. New York stands second and Louisiana third. A few years ago Michigan and Wisconsin led in this product, but so much was recklessly cut away that these states ranked fourth and fifth in 1910. In Washington much spruce is cut, and the Douglas spruce, or Douglas fir, furnishes some wonderful logs. Much hard wood is cut in the southern mountains, and much pine in the low country, and Louisiana furnishes much cypress.

In our next volume we shall tell you more about this wonderful country of ours. In it we shall speak of the mineral products and of the manufactures which are so important. As you see, we have been telling you only of the things which grow out of the ground and are called vegetable products. We shall also tell you something of the people who now live in the United States.

THE NEXT STORY OF THE UNITED STATES IS ON PAGE 2803.

The terrible curse of drink—Robert Martineau's picture The Last Days in the Old Home.

ALCOHOL, THE ENEMY OF LIFE

CONTINUED FROM 2569

ALCOHOL, the product of the fermentation of sugar by the yeast plant, forms part of the daily diet of many people and is consumed in enormous quantities. In various parts of the world large areas of land are devoted to crops that yield a quantity of sugar, or of starch that can be readily turned into sugar, for the production of alcohol for drinking.

In this country immense sums of money are still spent every year on alcoholic drinks. And this is not spent in building up the bodies of men and women and growing children. It is worse than lost, for the effect of alcohol upon the nation, and especially upon the youth of the nation, is such that if the money were thrown into the sea every year the country would be a thousand times better off. As it is, men buy with it poverty, and crime, and cruelty to children, disease, insanity and death, all of them in rich abundance. Wealth is either life, or what serves life; *illth* is what injures life. And men take our essential elements of wealth—the land, the sunshine, the water, the air, and good useful foodstuffs—and turn them into these dreadful things.

But all this we shall study later. Meanwhile, remember that what is spent on drink would buy many battleships every year to defend our coasts.

It is true of every living creature, without exception, that poisons are more injurious to it when it is young than when it is grown up, because when it is growing it is developing. There is a great difference between growth and the miracle of development, and development may be stopped while growth goes on. Alcohol will do this, for alcohol is a poison, and there is no form of life that it cannot destroy if it is used in sufficient quantities.

Not even tuberculosis, one of the most deadly of diseases, causes so many deaths as alcohol. Tuberculosis is what is called "catching," for it is due to microbes which spread from one person to another. It used to be thought that children did not suffer from it, but now we know they do. There is in this country a terrible amount of tuberculosis among little children. Fortunately, however, we do not always catch diseases, even when their microbes enter our bodies. The microbes are the seed, but our

bodies are the soil, and the seed cannot grow if the soil is unsuitable.

Breathing foul air seems to make the soil ready for tuberculosis. That, of course, is why we sleep with our windows open. But there is another thing which makes the soil much more ready for the growth of this deadly seed, and that is alcohol. Ignorant people believe that alcohol opposes tuberculosis, but this is not true. It has been proved that there is much more tuberculosis where the quantity of alcohol drunk is large than where it is small. A district which consumes about three times as much alcohol as another district has more than three times the death-rate from tuberculosis. Alcohol breaks down the resistance of the body to the microbes.

THE LARGE NUMBER OF CHILDREN WHO DRINK ALCOHOL

Now it has been generally supposed that children do not get alcohol to drink in this country, but investigations have shown that, in spite of all laws, the state of things is not so different from that in Europe as we had thought. In some countries the problem of child drinkers has become serious. In a German town a government doctor found that seven out of ten children drank wine or beer daily. In London it was found that four out of every ten children examined in the primary grades of several schools drank alcohol regularly. The proportion in this country is not so great, but it is still too large.

It is perhaps not to be wondered at that some parents are still ignorant of the harm that alcohol may cause. It is not very many years since doctors themselves began to realize it. Not very long ago it was generally believed that alcohol had strengthening powers. Men supposed that beer gave them strength to work. But the great scientists have taught us that this is not the case, and we now know the truth of the matter.

WHAT SCIENTISTS SAY ABOUT BEER AS FOOD

The British Board of Education found that alcohol was interfering so much with the schools that it issued an official pamphlet on the subject, based upon the studies of many scientists. On the point of the food-value of beer the pamphlet says:

"It is true that it contains a certain amount of nourishment. There is, for example, a little sugar, and there is a small quantity of the food substance found in meat. To obtain enough food from beer for it to be of serious consequence as a source of energy, however, it would be necessary to take an extremely large quantity, and the good that might be done by the nourishing part of the beer would be more than counterbalanced by the harm done by the alcohol contained in so large a quantity.

"This is one important reason for not taking beer as a food. Another is the expense, for, even if no harm were done by the amount of beer which it would be necessary to drink, the cost of such a meal would be far greater than the cost of an equal amount of nourishment taken in the form of ordinary food. For these two reasons, therefore, beer cannot be considered to be one of the foods which the body requires."

THE BRAIN MORE WONDERFUL THAN ANYTHING ELSE IN THE UNIVERSE

But the cost is not the most important thing. There is a very clear rule about alcohol, and other substances like it, in the way they act upon the body. It is, first, that the younger and the further from its grown-up state the creature is, the more it is affected by the poison. That, of course, we can understand. The earlier the period of development, the more serious is a wrong step; the further, so to speak, the creature will go out of its right way.

The second point is that alcohol, and other substances like it, affect the body, whether developing or already grown up, in a certain precise order. Our bodies are made up of many parts, some of which we may look upon as older than others, and those which are older we must also look upon as lower. The backbone, for instance, is very old, for we know it is as old as the fishes; parts of the brain are very old, but we can trace in the brain, quite clearly, newer parts which are higher in their duties, and more easily upset. There is, indeed, a part of the brain which is often called the "new brain." It is by far the most wonderful thing in the whole universe, so far as we know it. Now, the point is that the newest and highest parts of the brain are also the most delicate. They are the most likely to be injured by anything when we are grown up, and if anything interferes with the development of a growing child,

these parts are the most certain to suffer. The same is true of injury done by old age or by disease; the last to come is the first to go.

THE GREAT LAW THAT THE LAST TO COME IS THE FIRST TO GO

"Last to come" has a double meaning, because it applies both to the race to which we belong and to ourselves as individuals. The parts and powers of the brain that develop last in ourselves, as we grow up, are those that have developed last in the history of the great line to which we belong.

The rule is that when the individual is disturbed in development, or is poisoned by anything that acts at all upon the brain, or grows old and begins to go downhill, as we say, that which last came is the first to go. On the other hand, the very oldest part of the brain, such as the part by which we breathe, is the least delicate. It is the first to come and the last to go. Every other part of a man's brain may have been practically destroyed, and he may be quite unconscious from a huge dose of alcohol, but the part of his brain which makes him breathe will hold on to the last, until perhaps the alcohol poisons even that, and then he dies.

This law about the different levels of the brain ought to be known by every intelligent person in the world because it is the greatest discovery ever made in this branch of science. It was made by an Englishman, Dr. Hughlings Jackson, who died only a few years ago.

Alcohol perfectly illustrates Jackson's law in every part of it. When young children are exposed to the effects of alcohol their development is interfered with most in its highest parts. That is the terrible thing about alcohol, and other substances like it, that they strike at us where we are most human, and interfere less with the least human parts of us. There are some hundreds of thousands of persons in the world to-day, of all ages, whose brains and minds have not properly developed. The most moderate figure goes up into the millions, but we know that that is far under the real facts. The lives of these persons are worth nothing to themselves and much less than nothing to us.

THE CELLS OF OUR BRAINS THAT CAN NEVER BE REPAIRED

We, of course, have to pay for their keep, and for all sorts of terrible evils, like crime, drunkenness and cruelty to children, which flow from the existence of these people. They all illustrate the truth of Jackson's law. The highest, the latest, the most delicate, the most human part of their brains has been injured, but they breathe as well as we do. No power on earth can repair this injury. It is one of the most remarkable facts about the brain, or, indeed, about nerve-cells anywhere, that once destroyed they are destroyed forever. No new nerve-cells can be made beyond those with which we are born, and no damaged nerve-cell ever recovers. Now, alcohol is very largely responsible for the making and for the existence of these unfortunate children and grown-up people; and all of them are so many terrible illustrations of Jackson's law.

Jackson's law applies in just the same way to cases where people of any age take a large enough dose of alcohol to affect their brains. They may do themselves no permanent harm, but while the brain is under the influence of alcohol we find that the last to come is the first to be affected, and to be the most affected. Now, it is very interesting for us to ask ourselves what it is in our brains and minds that is the very highest and latest thing.

THE POWER OF SELF-CONTROL MAKES MAN HIGHER THAN THE ANIMALS

What is it that a child learns last and finds most difficult to learn? What is it that some grown-up people have never learned? What is it that makes the difference between the highest type of man whom we can trust always, and always be sure of, and other people of whom we cannot be so sure? It is not the power to move one's body, certainly, nor is it the power to see and hear, nor yet the power to speak. It is not even the power to think, though people are apt to suppose so until they look into the matter. It is *self-control.* In creatures other than man there is almost no self-control. We may watch them at a zoölogical garden year in and year out and we shall find few signs of it. If we train one of the most intelligent of all animals, such as the dog, it is only fair to say that we find the beginnings of self-control there; but that, of course, is with man's help. The greatest thing in us—apart from love, which is greater in one sense—is the power to say "No": the power not to yield to this or

that or the other because of some consideration which we have in our minds, and which we regard as of higher importance.

It is the mark of savages that they have very little self-control. They act quickly, impulsively, as we say. The highest part of the brain is not so well developed in savages as it is in us. In children self-control is not an easy thing.

Why Children Cry and Grown-up People Do Not

When a child is hurt it cries. Older people may be hurt just as much, but usually they do not cry. The brain has learned how to control the tears. In the same way children will laugh more readily than grown-up people, and often they find it very difficult to keep from laughing at times when it is not at all polite to other people to do so. Lack of self-control is the most certain and constant mark of defective-minded people of all kinds; and it is the first and most certain mark of poisoning by alcohol, and other things of that class, that they strike at the most human thing in us, the last to come and the first to go. People who could keep their temper without alcohol lose their temper under its influence; they start laughing or crying, and cannot stop, at things which would not have made them either laugh or cry when they were all right; they do rash things when anyone puts the idea into their heads; they lose their caution and their judgment; they say things that they would not usually say. We commonly suppose that the first effects of alcohol are when the muscles of a man's body are affected. But that is a great mistake. The first effect of poisons of this kind is shown upon the highest parts of the brain, which have nothing to do directly with any muscles. The muscles are directly controlled by the lower part of the brain.

How Alcohol Spoils the Highest Powers of Man

It is only later that the levels of the brain which work the muscles are affected, and always Jackson's law holds good, and these parts of the brain are affected less than the parts above them. The latest and most delicate movements are affected first. The most human movements, so to speak, are those of the thumb, and these are injured very quickly, as the writing shows, or any kind of delicate movements in which the thumb is concerned. Then the delicate movements of speech are affected, and next the delicate movements by which the two eyes work together. Under the influence of alcohol they work separately, so that the person sees double. Afterward the coarser movements, such as those of walking, are affected; but, as we have already learned, the movements of breathing remain to the last.

How Alcohol Deadens the Sense of Right and Wrong

People who drink alcohol lose the sense of right and wrong. They tell long stories about things that never happened, and exaggerate so that you never know when they are speaking the truth. At first this loss of the moral sense is hardly noticeable, but it gradually increases, until at last all sense of responsibility and duty is swept away. "The cries of cold and hungry children make no impression on a brain dazed with alcohol, and no emotion of affection or desire to protect is aroused by the cry of a suffering child." Indeed, men under the influence of liquor will often strike or cruelly beat their own little ones. It is a fact well known to workers among the poor that the greatest barrier to their efforts to uplift the people is alcohol. It deadens all higher thought and kills the desire to become neat and cleanly and healthful.

Destroying One's Own Life as an Effect of Alcohol

Alcohol has the most depressing effect upon the brain. The short period of brightness and excitement produced by it soon passes away and is usually followed by a long fit of the "blues." While the body is trying to come back to its normal condition people sometimes take their own lives in what is termed a spell of temporary insanity. It is the opinion of one doctor that alcohol is to blame for many tragic deaths among young men and women. An investigator studied 220 attempts at suicide. He found that three-fourths of the number were more or less under the influence of liquor.

So long as the effect of the alcohol is in the system people look at life from an unnatural point of view. They are subject to jealousy and to fits of rage, and are usually very quarrelsome. As a consequence they do all sorts of foolish and wrong things, and may even commit crimes from which, when not under its influence, they would shrink with horror.

THE NEXT STORY OF OUR OWN LIFE IS ON PAGE 2837.

STORIES SHAKESPEARE TOLD

GREAT books may be written either in prose or in poetry. The dramas of William Shakespeare were all written in poetry, but we shall tell the stories of these famous works just like other stories. Though Shakespeare's plays were written for acting on the stage, they are also among the most beautiful books that we can read. We must bear in mind that most of Shakespeare's comedies and tragedies were founded on stories which he did not invent. Some of the stories had been favorites on the Continent and in England long before the great poet made use of them for his plays. They might have been forgotten forever if he had not retold them by means of the characters he created, and in his own wonderfully beautiful language. He wrote both tragedies and comedies, and he excelled all other dramatists that the world has known by being equally great in tragedy and comedy. A tragedy is a poetic play in which the characters suffer great sorrows, some of the chief persons die, and the end is sadness. A comedy is a play in which all ends happily.

A MIDSUMMER NIGHT'S DREAM

THERE was once a Duke of Athens named Theseus who was betrothed to Hippolyta, Queen of the Amazons. It happened that when they were talking of their coming marriage, an elderly courtier named Egeus came to them with his daughter Hermia and her two rival lovers, asking for the help of the Duke. It was her father's wish that Hermia should wed Demetrius, yet she would have none but Lysander. On hearing this Theseus told her that, by the law of Athens, she must do as her father wished. Else she could be put to death or condemned to remain unmarried all her life.

Hermia was fain to profess she preferred to remain unmarried. But when she had drawn apart with Lysander they agreed to meet the next day in a wood a mile distant and escape from Athens together. They took another into their secret, however, telling their plans to Helena, a friend of Hermia. As Helena was in love with Demetrius, she thought that if she told him of Hermia's purpose he would follow the lovers. Poor Helena herself intended to go after them so that she might have the happiness of being near Demetrius, although he was not fond of her.

About this very time, Oberon, the king of the fairies, had quarreled with his queen, Titania, because she would not give him a little negro boy, of whose mother she had been very fond. Oberon decided to play a trick on Titania for this. So he told Puck, his mischief-loving fairy servant, to put the magic juice of love-in-idleness into Titania's eyes as she slept. When she awoke she was bound to fall in love with the first living creature she might see.

It so chanced that a company of rough workmen were rehearsing in that wood a little play which they were to perform at the wedding festivities of Duke Theseus. By a magic touch Puck changed the head of one named Bottom, a weaver, into that of an ass! This fat, ungainly man with the ass's head was the first thing Titania, the lovely queen of the fairies, saw when she had rubbed the sleep from her eyes. Thanks to the juice of love-in-idleness, she straightway fell in love with Bottom. She wound her arms about his hairy neck, bound flowers around his flapping ears, and bade her fairy attendants obey his every wish.

Puck had also been told by Oberon that an Athenian who was lost in the wood was neglecting his true love for a maid who shunned him. He bade the mischief-making fairy change the heart of his misguided Demetrius. But Lysander and Hermia, wearied with their walk from Athens, were lying down to rest when Puck came flying past. Mistaking Lysander for

Demetrius, the fairy squeezed the magic juice into his eyes. Then, Helena coming up as Lysander awoke, he immediately told her of his love for her. The charm had worked on the wrong lover. Lysander now left Hermia and followed Helena, who always fled from him, as she still loved Demetrius. Presently, while Oberon and Puck were roaming in the wood, they found poor Hermia trying to dismiss the persistent Demetrius. On discovering that this was the Athenian of whom Oberon had spoken, Puck at once repaired his mistake by charming the eyes of Demetrius, who, seeing Helena next, straightway fell in love with her. But imagine the dismay of Helena when she thought that both Lysander and Demetrius were mocking her in now pretending to be in love with her! Happily, what the magic love-juice could do, it could also undo, and another drop of it from Puck soon restored Lysander to his Hermia.

Oberon, in the meantime, had begun to regret the trick played upon his queen. Having obtained the little black boy from her while she thought herself in love with the donkey-head, he made her believe that she had only been having a foolish dream. He restored her eyes to their usual sense, agreeing that they would never quarrel again. Bottom, the weaver, was also made happy by getting his own head back, though he had been happy enough with the ass's head.

The sound of a horn rang through the wood: Theseus and Hippolyta were out hunting. They came upon Helena and Demetrius, Hermia and Lysander, all of them happily reconciled to one another. When Egeus reminded the Duke that this was the day for Hermia to make her final choice, Demetrius told how his love had changed, saying:

> "And all the faith, the virtue of my heart,
> The object and the pleasure of mine eye,
> Is only Helena."

So Lysander had no longer a rival for the hand of Hermia. To celebrate the day with merriment they all went to the palace to watch the workingmen's play in which Bottom, the weaver, was the principal actor.

ALL'S WELL THAT ENDS WELL

BERTRAM, the young Count of Rousillon, in the south of France, bade farewell to his widowed mother before he left their castle for the court of the King at Paris. His mother was not alone in her sorrow over his departure. No sooner had he gone than Helena, a lady whom the Countess had brought up as if she had been her own daughter, was overwhelmed with grief. She mourned because she loved Bertram, yet dared not let it be known, as she, the daughter of a physician, though he was a famous one, could not hope to marry a nobleman of the royal blood of France.

In the midst of her grief a daring idea came to Helena's mind. The King of France was then so ill that all his learned men despaired of his life. He was suffering from a disease which her dead father had been able to cure—and the remedy for which Helena knew. "Why," thought she, "should I not also go to the court of the King?" Her thoughts she spoke aloud, thinking herself alone; but she was overheard by a servant, who told the Countess.

Instead of being angry, the Countess told her that she had discovered the real cause of her tears, and even said she would welcome Helena as her daughter-in-law, promising to aid her in the mission to the King.

When, in due time, Helena came before the ailing King, he was unwilling to allow her to try to cure his disease. But she persisted, saying that if she failed she was willing to suffer any punishment. As her reward on his recovery she demanded that he should give her as her husband a nobleman of the royal blood of France, to be chosen by herself. To this he agreed.

After the King recovered, he called together a number of his courtiers, explained the terms he had arranged with the fair physician, adding that he would give her wealth and raise her rank in gratitude for having cured his disease. When Helena went forward to Bertram and signified him as her choice, the young Count hotly refused thus to be forced into marriage. But his sense of loyalty overruled his pride, and he at length agreed to marry Helena. No sooner was the ceremony over, however, than he arranged secretly to go to the wars in Tuscany and leave his unsought bride.

Poor Helena, the unconscious messenger of evil tidings, brought back to the Countess at Rousillon a letter from her son, in which he vowed never to return. He also told Helena he would never see her again until she had obtained a ring with which he never parted.

Helena, gentle and timid in most things, was not to be repulsed in this disdainful fashion. So, dressed as a pilgrim, she set out for Florence, in the country of the wars.

In Florence there lived a widow and her daughter Diana. Often had Bertram told Diana of his love for her, though she had always refused to listen. He even wished her to promise to be his wife when Helena should die. But Helena, unknown to Bertram, had come to stay in Florence with this widow and her daughter. Nor did she ask for their help in vain. Diana now showed more friendliness to Bertram, and begged him to give her his ring, saying she would give him one in return.

In the darkness of the night, at the appointed place, without saying a single word, according to the agreement, rings were exchanged between Bertram and—not Diana, as he supposed, but Helena, whom he could not see.

Meanwhile, in France, it had been given out that Helena was dead, since she had disappeared from Rousillon. In Bertram's absence it was arranged that he should be married a second time, and to a bride of nobler birth. Bertram, however, discovered a sudden love for the wife he supposed lost, and on returning to his ancestral castle he refused to marry again. The widow from Florence came to Rousillon, where the King was on a visit, and with her were Diana and Helena, disguised.

Diana told a strange story to the King, and all were completely mystified by Diana's declaring that the ring had been given to her, yet not to her; that Bertram had met her at midnight, yet that it was not she. The riddle was solved by bringing forward Bertram's still-living wife, who had actually got the ring from him.

So Helena and Bertram were, after many trials and misunderstandings, happily united, and "all's well that ends well."

THE TEMPEST

LONG ago, on a bare and lonely island in the Mediterranean Sea, there lived three people. One was a wise old man named Prospero, who had with him his beautiful young daughter Miranda. The third was their servant Caliban. But although there were only three people, Prospero had yet another servant—a fairy, or a "tricksy sprite," named Ariel. Ariel loved his master dearly, because he had once been imprisoned in the heart of a pine tree and Prospero, who knew the secret of many mysteries, had rescued him from that strange prison in which he had been secured by the magic of an old witch named Sycorax, who once lived on the island. Caliban was her son, a creature so low and ugly as to be scarcely human.

It happened that one day when Miranda was looking out at the wild, storm-tossed sea she saw a vessel in distress. Knowing that her father had learned the secrets of magic power, she begged him to calm the sea and save the poor sailors from death. But he answered that he himself had caused that very storm to rise, and calmed her fears by promising that nobody would be drowned. The story which he then told her was strange indeed.

"Twelve years ago," said he, "I was the Duke of Milan, but I cared nothing for wealth and power and fame. I was happiest only when with my little child and my books. My brother, your uncle Antonio, to whom I left the government of the state, was not like me. Greedy of power and possessions, he wanted my dukedom for himself. To this end he went to the King of Naples—then an enemy of mine—and promised that if the King would help him to steal my lands he would richly reward him. It was so agreed. One night these enemies of mine secured both you and me and hurried us away into an old ship that could scarcely float. Happily, some good friend saw that the boat contained no lack of useful things, and, above all, my beloved books, which have been of so great comfort to us since our leaky vessel floated to this uninhabited island. And now the tide of fortune is turning. By means of the wisdom I have gained, my ancient enemies, all of whom are in that storm-tossed

ship, will soon be delivered into my hands."

Even while Prospero was talking, his fairy servant Ariel had made himself invisible—for, of course, he could do anything that fairies do, and might even have crouched inside a little girl's thimble. He beached the ship in less time than fifty sailors could have done it, and he brought the crew to shore, though no one could tell how. He next took Ferdinand, the son of the King of Naples, apart from the others, leading him to where Prospero and Miranda were—perhaps just by whispering in his ear! There is no outwitting a fairy like Ariel, unless one is a witch like Sycorax.

As soon as Miranda set eyes upon the Prince she fell in love with him. And he—well, he thought he would never be happy without her. Prospero noted this and was delighted. But he desired to test Ferdinand's love, and pretended at first to treat him as a spy.

In another part of the island the King of Naples and his companions rescued from the ship were lying asleep. But the King's own brother, Sebastian, and Antonio, the usurper of the dukedom of Milan, were awake and were plotting to kill the King in order that they might obtain his possessions if they got back to Italy. But they reckoned without the tricksy Ariel, whose wise master had sent him to watch over the King. The lively but invisible little sprite sang in the ear of Gonzalo, the kind old nobleman who had provided Prospero with his books and valuables when he was sent adrift. This was what he sang:

"While you here do snoring lie,
Open-ey'd conspiracy
His time doth take.
If of life you keep a care,
Shake off slumber and beware.
Awake! Awake!"

Up started Gonzalo, then the King awakened, and they decided to set out to look for Ferdinand. So the evil designs of Sebastian and Antonio were ruined by Ariel, who led the company to a cave, outside of which Prospero had drawn a magic circle.

When they were all standing spellbound within this magic circle, Prospero, dressed in the rich clothes he had brought from Milan, appeared before them. His old enemies were in doubt as to whether this might not be his spirit, but he told them his strange story, and said that he forgave them all freely.

The King of Naples now told Prospero that he had lost his son on the island. Prospero, smiling, said that he had just lost his daughter. Then, leading the party into the cave, he showed them Ferdinand and Miranda playing happily together at chess. Both fathers joined in blessing the two lovers.

So pleased was Prospero with the good service of Ariel that he set the faithful fairy free before the whole party sailed away for the wedding of Prince Ferdinand and Miranda.

THE MERCHANT OF VENICE

ANTONIO was the name of a very rich and generous man who lived in Venice long ago, and whose merchandise many ships carried over the seas to distant lands. Though Antonio was so rich, his greatest friend, Bassanio, was so poor that he once said of himself, "All the wealth I have runs in my veins," meaning that he was a gentleman, but lacked worldly possessions.

Now, this Bassanio loved very deeply a lady both beautiful and rich, named Portia, who lived in a distant place called Belmont. When once he desired to visit her, he confessed to Antonio that he could not go there for lack of money. On hearing this, Antonio, ever ready to help a friend, began to arrange for Bassanio to get the necessary gold. Unfortunately, at that time Antonio's ships were all at sea, so that his wealth was on the waters, and for that reason he had no ready money. At length he determined to borrow from an old Jew, who was a regular money-lender. Shylock was his name, and he hated Antonio because that kind merchant would always lend his money without charging interest, thus injuring Shylock's trade. He also knew that Antonio despised him. And, above all, he disliked Antonio because he was a Christian. So when his enemy, as he regarded Antonio, came to borrow money from him, thoughts of revenge passed through the Jew's mind.

If only Antonio's ships were wrecked, or if pirates should steal from them, Antonio would not be able to repay the

Where the bee sucks, there suck I;
In a cowslip's bell I lie:
There I couch when owls do cry.
On a bat's back I do fly
After summer merrily.
Merrily, merrily shall I live now,
Under the blossom that hangs on the bough.
THOMAS MAYBANK

ARIEL'S SONG, FROM SHAKESPEARE'S PLAY THE TEMPEST

Ariel's Song describes the life of a fairy supposed to be the servant of a wise prince in exile, as told on p. 2687.

loan, said Shylock. But the cunning Jew then pretended to make a bargain in jest, and offered to lend the money on condition that Antonio repaid it in three months' time, or else forfeited a pound of his own flesh! Antonio did not doubt that his ships would return in time, so agreed cheerfully to this strange bargain. He got the money which enabled Bassanio, accompanied by his friend Gratiano, to go on his visit to Portia, the rich heiress.

It was known that when Portia's father was dying he gave her three caskets—one of gold, one of silver, and one of lead. On each of these was an inscription. "Who chooseth me shall gain what many men desire," was written on the gold one. "Who chooseth me shall get as much as he deserves," was on the silver one. And on the lead one were the words, "Who chooseth me must give and hazard all he hath." Inside one of these caskets was a portrait of Portia. Whichever one of the men who professed to love her should choose that casket was to wed her.

Various suitors came to try their fortune in this strange lottery of love, and those who were conceited chose the gold or silver caskets. But now came Bassanio, whom Portia really loved, and she and her maid, Nerissa, trembled lest he should take the wrong casket. He chose the leaden one, in which, of course, was the portrait.

In the midst of all their joy at this happy choice, Bassanio received a letter from Antonio, who said that all his ships were lost, and Shylock was demanding his pound of flesh. But he added that he would gladly die for his friend if Bassanio were only there to bid him farewell.

Bassanio told his lady the unhappy story, and she bade him haste away to be with his friend. As soon as he had gone she sent to her cousin, a famous lawyer, Doctor Bellario, to borrow his robes. With these for herself, and the dress of a lawyer's clerk which she had borrowed for Nerissa, Portia and her maid set out for Venice.

Assembled in the Court of Justice there were all those interested in the strange case—Antonio, Bassanio, Shylock, Gratiano, the Duke of Venice, and many others. Nerissa, dressed as a lawyer's clerk, entered and read a letter from Doctor Bellario, in which he wrote that he was ill, but his young friend, Doctor Balthazar, from Rome, would defend the case ably, and that he had never known "so young a body with so old a head." Thus was Portia, disguised as a lawyer, announced.

Now, Portia was as wise as she was beautiful. In her speech she first of all raised the hopes of Shylock until he praised her for "a Daniel come to judgment." He was entitled to the pound of Antonio's flesh, she argued. But she made two conditions—first, he must take exactly one pound in weight, not the weight of a hair more or less. Secondly, he must not take one drop of blood, as that was not mentioned in the bond.

Of course these conditions were impossible. Shylock, now seeing where his blind hatred of "the fool that lends out money gratis" had led him, was willing to leave the court without his money, since to take his bond would have led to his being condemned to death himself. But Portia would not let him go so easily. She stayed him, saying:

"There is a law whereby, if any foreigner in Venice shall scheme against the life of a citizen, his money shall be forfeited, half of it going to the State, the other half to his intended victim, and his own life will rest with the mercy of the Duke."

Thus Shylock lost his bond and might have lost his life. But that was spared on condition that he will his fortune to his own daughter, Jessica, whom he had ill-treated, and to her lover, Lorenzo, and also that he renounce his religion.

In his delight at the happy issue, Bassanio offered the pretended doctor of laws anything he might ask. To his dismay, a ring which Portia had given him on his departure from Belmont was required of him. The lawyer's clerk also demanded Gratiano's ring which Nerissa had given to him.

When Bassanio returned to Belmont, bringing with him Antonio to see Portia, she and Nerissa asked for their rings, which neither of the men could produce. After pretending to be very angry with their lovers, Portia and Nerissa showed the rings on their own fingers. Antonio then knew whose wise speech had saved his life. His joy was complete when Portia gave him a letter in which it was stated that three of his ships, which were thought to be lost, had safely come to port.

OTHELLO, THE MOOR OF VENICE

THE city of Venice, though now only one of the many beautiful towns of Italy, was formerly the scene of a great republican government. It sent its ambassadors to the mighty nations of the world and ruled over many other towns as well as Venice itself. Its ships traded to far countries, and its soldiers and sailors won colonies in other lands. In these great days a Moor, or dark-skinned man from the North of Africa, named Othello, was a brilliant leader of the army of Venice. He was a man of noble mind, despite his dark skin, and so able that he was sent to be governor of the island of Cyprus, which then belonged to Venice.

In addition to all his triumphs as a soldier, Othello had the fortune to win the love of one of the most beautiful women in Venice, Desdemona, the daughter of Brabantio, a senator, or member of the Government of Venice. It may seem strange that this Moor should be loved by a fair lady who had refused many richer suitors. But she thought more of his noble mind than of his looks. All her delight was to listen to his thrilling tales of the battles in which he had fought, of his hairbreadth escapes, of strange adventures through which he had passed by land and sea.

Now her father, Brabantio, did not know of the things she kept hidden in her heart, as she knew he would never approve of her wedding the Moor. His anger was terrible when one night he was awakened by two men, who told him that Desdemona had left him and had been married to Othello. One of these men was Iago, who long had served the Moor as one of his officers. But he hated him bitterly, since Othello had chosen Cassio as his lieutenant when Iago thought he should have been preferred. Iago was cunning, spiteful, and capable of any villainy; while Cassio was frank and open, but easily led astray.

Brabantio appealed against Othello to the Duke of Venice and the senators, who at first were in his favor. But Othello answered the charge of stealing away Desdemona in so manly a way that the Duke and others were soon won to his side. Desdemona herself proved that she loved the gallant Moor and was proud to be his wife.

That very night the devotion of Othello to the country he had served so well was put once more to the test, as he was ordered off to defend Cyprus, which was in danger of being attacked by the Turks.

The great soldier at once set out for Cyprus, Desdemona being left in the care of "honest Iago," as Othello thought him still faithful. Iago's wife, Emilia, was asked to attend on Desdemona. Cassio followed in another vessel; Iago, with Desdemona, setting sail a third. Cassio was the first to arrive, his vessel having lost Othello's in a storm, and Iago, who had "had most favorable and happy speed," reached the island before the Moor. Iago's hatred of Cassio for having been preferred by Othello was speedily shown. His crafty mind set to work to ruin the lieutenant, whom Desdemona treated with greater friendliness than she did the malicious Iago.

When Othello arrived, soon after Desdemona, he was not displeased to hear that the Turkish ships had all been shattered in the storm which had so nearly wrecked his own vessel. Now he was able to devote more time to his bride, "my fair warrior," as he lovingly called her. On the night of his arrival he bade Cassio keep order in the castle, and see there should be no disturbance among the soldiers. The crafty Iago, however, now began to work his plot, plying the luckless Cassio with wine until he became intoxicated. In a drunken brawl the lieutenant wounded Montana, the governor of the island, whom Othello was to replace. Coming on the scene of the disgraceful brawl, Othello heard an account of it from Iago, the mischief-maker. Thinking that Iago was trying to shield Cassio by making light of the matter, Othello said, with sorrow, "Cassio, I love thee, but never more be officer of mine." Thereupon he appointed Iago to take charge of the guard. Thus, the first part of the villain's scheme of treachery had succeeded. But worse—far worse—was yet to come.

Poor Cassio now appealed to Desdemona that she might intercede with her husband on his behalf. This the gentle Desdemona did. But Iago's new villainy was to make Othello believe she pleaded for Cassio because she had fallen in love with him. So craftily was the poison of doubt instilled into Othello's mind that

at length the Moor began to lose faith in his wife. Believing she had ceased to love him he became almost mad with jealousy. Chance favored the evil designs of Iago. It so happened that before they were married Othello had given Desdemona a beautifully worked handkerchief supposed to be of magic power, to make its owner loved and amiable. But it would make her become hateful to her lover if ever she should lose it. Iago longed to get possession of this, and urged his wife to steal it.

One day, when Othello was in an ill mood of doubting, and complained of a pain in his head, Desdemona offered him the handkerchief. He put it from him, saying, "Your napkin is too little," and it fell to the floor, where Emilia quickly picked it up and passed it to Iago. This fateful little handkerchief now became a tool of great mischief, as it was conveyed to Cassio's house by Iago. Poor Cassio, finding it, presented it to a woman as a pretty thing, not knowing to whom it had belonged. Nor could he guess that Othello had been brought by Iago to watch him with the handkerchief, as a proof that he had received from Desdemona a gift she should have esteemed so precious.

Othello, now believing that his wife had ceased to love him, determined to kill her. As she lay asleep in bed he bent over her and kissed her. She looked so beautiful. His kiss awakened her, and in answer to her frightened questions he bade her say her prayers, telling her he knew of her love for Cassio. In vain did poor Desdemona plead her innocence; her jealous husband covered her with the bedclothes and smothered her.

She was not yet dead when Emilia got into the room and told of her husband's, Iago's, evil doings, exclaiming that the misguided Moor had murdered a saint, whose last words were of love for him.

Iago, who had come in, stabbed his wife for denouncing him, and then ran out. Others arrived and Iago was brought back, Othello in his anger wounding him but not killing him.

Realizing in an awful agony how beguiled he had been to trust so vile a man and mistrust so good a wife, Othello stabbed himself. Falling upon the body of his innocent bride, he exclaimed with his dying breath:

"I kiss'd thee ere I kill'd thee:—no way but this,
Killing myself, to die upon a kiss."

TWELFTH NIGHT; OR, WHAT YOU WILL

ILLYRIA was the name of a country on the Adriatic Sea. While sailing thither, the twin son and daughter of a gentleman of Messaline were wrecked. The youth's name was Sebastian, his sister was called Viola.

Both of them had the good fortune to escape from drowning during the shipwreck. But they did not reach the land together, and each was ignorant of the other's fate. Viola was saved by a sea captain, by whose help she contrived to dress up as a page, and made her way to the court of Orsino, Duke of Illyria. It was safer for her to assume this disguise than to travel as an unprotected girl in a strange land, and she looked such a handsome boy that she had no difficulty in being accepted as a page.

Now, the Duke was in love with a young and rich lady of his land, the Countess Olivia, and wished to marry her. But Olivia had rejected his proposals, refused to see him, and even spoke of shutting herself up for seven years to mourn for a dead brother.

The Duke thought that his handsome young page would be a good messenger to send to Olivia on his behalf. So Viola was sent by Orsino to plead with the fair countess on behalf of her princely lover. Greatly to Viola's embarrassment, instead of softening Olivia's heart toward the Duke, the messenger had spoken so sweetly that Olivia fell in love with the pretty page.

A new and extraordinary figure now came upon the scene in the person of a drunken old courtier named Sir Andrew Aguecheek, who had the audacity to consider himself a rival for the hand of Olivia. This Sir Andrew, noticing that the Countess was so favorably disposed to the engaging young attendant of the Duke, made bold to challenge the page to a duel.

Viola's disguise had thus brought her into a strange adventure, and she had no idea what the issue would be. But three months had now passed since the shipwreck, and her brother Sebastian, in company with his friend Antonio, who

was so devoted to the young gentleman that he had even given him all his money, was on his way to the palace of Orsino. Antonio, having been at the time in arms against the Duke, was afraid to accompany Sebastian to the palace, and thus, to their mutual sorrow, the two had to separate.

Soon after leaving his friend, Antonio was surprised to come upon two persons about to engage in a duel. Thinking the younger of them to be none other than Sebastian, he promptly interfered on his behalf. The duelists, however, as we may guess, were Sir Andrew and Viola, the notorious old coward having forced the young page to draw her sword, much against her will, just at the moment of Antonio's timely arrival. The immediate result of Antonio's interference was not only to stop the fight, but to bring some of the followers of the Duke upon the scene. They recognized him as a former enemy and put him under arrest. Thereupon he turned to Viola, and asked her—thinking her Sebastian—to give him back some of his money, knowing he might have need of that. Viola showed her natural astonishment at this request, and protested that she had never seen him before, arousing his indignation by her supposed attempt to cheat him.

While Viola's adventures were thus increasing, Sebastian, too, was having his share of misunderstanding. Sir Andrew Aguecheek, balked of his revenge on the timid page, came upon Sebastian in front of Olivia's house. Mistaking him for Viola, he drew his sword upon the youth. But the coward had soon excellent cause to regret having forced the youth to fight. The Countess, having witnessed what she supposed to be the manly conduct of the Duke's page in the encounter with Sir Andrew, was more than ever charmed with him. Inviting Sebastian into her house, she frankly declared her love for him and her willingness to marry him.

Here was, indeed, the strangest of Sebastian's adventures. As the lady was young and lovely, he accepted the situation gallantly, and, a priest being at hand, the wedding ceremony was not delayed. Olivia no longer dreamed of seven years' mourning!

The next scene in this queer comedy of errors takes us to the audience-chamber of the Duke, whither Antonio had been brought by his captors before Orsino. There Antonio, seeing Viola with the Duke, and still mistaking her for her twin brother, chided her for the way in which she had repaid his constant friendship of the past three months.

The Duke, of course, was mystified completely by Antonio's words, as he had had his page for three months. Confusion became worse confounded when Olivia arrived, and seeing Viola there, addressed her as "husband." The Duke was enraged that his attendant should, as he now thought, have betrayed his trust and made love to the lady. Nor were matters improved when Viola denied Olivia's statement that they were married, and the priest who performed the ceremony was called to bear witness to it! Sir Andrew Aguecheek added a further touch to the confusion by appearing and stating that the Duke's page had but recently in a quarrel broken his head, and that of his boon companion, Sir Toby Belch, Olivia's uncle.

When matters were thus at their worst, all was suddenly made clear by the appearance of Sebastian himself. When the real Sebastian and Viola dressed as a page stood side by side, everyone was greatly amazed. Antonio could only gasp that he did not know which was his friend. Sebastian stoutly declared that he alone had the right to his name, as he had no brother and his sister had been drowned. Viola said that her brother Sebastian had gone to a watery grave, but his form had been that of the man who now called himself Sebastian.

By comparing remembrances of their father and their childhood Sebastian and Viola realized that they were brother and sister. Viola explained that the captain who had saved her life had her real clothes in charge. The Duke at once told her to go and take off the page's uniform and dress in her own raiment. The captain who had rescued Viola was in prison, but through Viola's appeal to the Duke the good sailor was released.

As Sebastian had become the husband of Olivia, who while refusing to become the wife of the Duke, was nothing loth to be his "sister," Orsino chose the true romantic ending for this comedy by offering his hand and heart to Viola. Viola had already learned to love him and they were married immediately.

THE NEXT STORIES ARE ON PAGE 2813.

HOW INDIA LIES BETWEEN MOUNTAIN & SEA

India for hundreds of years lived a life peculiarly its own, cut off from the rest of Asia by the highest mountains in the world. The only ways of reaching this wonderful country are over the mountains or by the sea, and the storms of the Indian Ocean prevented the small ships of the earliest sea-rovers from reaching it. Thus India remained an almost unknown land to the West until the European ships rounded the Cape of Good Hope. There are but few openings in the mountains of the northwest, such as the Khyber and Bolan Passes.

Camels carrying the merchandise of India over a bridge of boats.

INDIA, THE PEARL OF THE EAST

CONTINUED FROM 2581

FAR away in the East, on the south side of the continent of Asia, lies the vast country called India, full of people who are very unlike our own countrymen—people who talk a strange language, and wear strange clothes, and live in strange houses, and have strange manners and customs, and strange religions; people who are not all like one another, as English and Scots and Irish are alike, but just as different as they are from Spaniards, or Italians, or Germans.

Yet they all have a kind of likeness, just as all the European peoples have a kind of likeness; they are different from one another, but not so different as they all are from Europeans. For India is a very large country, as large as Germany and Austria and France and Spain all rolled into one; so large that there are over twice as many people in it as there are in all North America—nearly 300,000,000 people! And it has been the business of a few thousands of English people to rule over all those millions; to give them laws, and to make sure that the laws are obeyed; to prevent the strong from injuring the weak, and the cunning from injuring the simple; to give justice to all with an even hand.

India is not only a very big country, but mountains and rivers and plains, the geographical features are what we call on a very big scale—as if we looked at the things to which we are accustomed through a powerful magnifying glass. The highest mountain in the whole world, Mount Everest, is on the Indian frontier; it is more than four times as high as Mount Mitchell, one half higher than Mount McKinley, and nearly twice as high as the biggest in Europe, Mont Blanc.

The two biggest rivers, the Indus and the Ganges, are not quite so large as the Volga or the Danube, but are both over twice as long as the St. Lawrence. And in like manner, the biggest kinds of wild animals live in India—elephants, which man has tamed for his own service; lions, though they are few now; great leopards and tigers, the strongest and most beautiful and most cruel of all the cousins of our tame cats; and fierce wild cattle, with mighty horns, which the tiger himself is often afraid to fight; and crocodiles in the rivers, which drag down men and cattle if they catch them; and snakes, large and small, including the most terrible of all, the deadly cobra, for whose bite there is no cure. Again, in like manner, the Indian sun scorches with a heat we can hardly imagine in the north, and rain falls in rushing torrents such as

we seldom see in the biggest thunderstorms that burst on our own country.

Now let us look at the whole of this big country, with the map appearing on page 2694, and notice the important things about its formation, its boundaries, its mountains, its river and plains, and the sites of its cities.

HOW INDIA IS HEMMED IN BY THE MOUNTAINS AND THE SEA

First of all you see that the southern half of India is a triangle or wedge, pushed out into the Indian Ocean, so that it is bounded on the southwest and on the southeast by the sea. This part we call the Peninsula. And then you see that a huge chain of mountains curves in a rather crooked sort of way from the top left-hand, or western corner, of the Peninsula northward, and then eastward till it comes down to the top right-hand corner; so that on the northwest, north and northeast India is bounded by mountains.

You cannot get at India at all unless you come to it by sea or make your way through the mountains. And those mountains are so high and so difficult to get through that there are really only two passes by which armies have been able to get into India, and both of these are on the northwest side. So that if those passes are so well guarded that an enemy cannot force his way through, an invader cannot get into India unless he comes across the sea. There, you see, is a very good reason why the peoples who inhabit India grew up apart from other nations, so as to be unlike them, keeping their own manners and customs; for in ancient times fleets of ships could not make long sea voyages, as they do now, and the coast of the Peninsula was too far away from other lands for anyone to think of invading India by sea. Sea and mountains were a barrier between the Empire of India and the rest of the world.

THE NORTHERN HALF OF INDIA, WHICH IS CALLED HINDUSTAN

The next thing to notice is that the wedge broadens out a great deal at the top, and just below the place where it broadens is a river which rises a little east of the middle of the country and flows very nearly due west till it falls into the western sea. This river is called the Nerbudda, and it divides India into a northern half, which is called Hindustan, and a southern half, which is called the Deccan.

Now, in Hindustan are two very big rivers. On the west, flowing almost from north to south along the foot of the barrier-mountains, is the Indus; and several other rivers join together and flow into the Indus when it is about halfway on its journey to the coast. The land through which these rivers flow, down to where they all join the Indus, is called the Punjab, which means the Land of the Five Rivers. The other great river, which flows from west to east, is called the Ganges, and some people, when they talk of Hindustan, mean just that great low-lying plain watered by the Ganges and the rivers which are its tributaries. The plain, or basin, of the Ganges is the most fertile part of India. But between the lower part of the Indus on the west and the Ganges on the east there is a great deal of country where there are no rivers at all, and very much of this is desert.

THE SOUTHERN HALF OF INDIA, WHICH IS CALLED THE DECCAN

In the Deccan there is nothing like the great plain of the Ganges, or even the Punjab. Most of it is high tableland; steep on the west side, where the mountains are called the Western Ghats, and there is only a narrow strip of low land lying between the hills and the coast; but shelving down on the eastern side, so that here and there are wide plains which form the district called the Carnatic. One of the great rivers of the Deccan is called the Godavery; it is famous for some very wonderful waterfalls. Right in the heart of the Deccan there is a place called Golconda, which was once the capital of a mighty kingdom. In those regions great store of gems was found, and these were brought to the jewelers of Golconda, so that the wealth of Golconda became a proverb.

India is a very hot country. Sometimes in winter, up among the high barrier-mountains—which are hardly in India—it is quite cold. All other places, even the coolest, are much warmer than England; and in all the great plains where the rivers flow, and still more in those plains where there are no rivers, it is always hot. In the hot season the heat is so trying that many Europeans

THE HOME LIFE OF THE PEOPLE OF INDIA

In India most of the people earn their living by growing rice, wheat and other crops. They are their own millers, and here we see some friends who have gathered together outside one of their thatched huts to grind some rice by placing it into a stone jar and pounding it with poles. While doing this they can talk to one another and look after their children playing round them. Life among these people is very quiet and peaceful, unlike that of our city people, who spend their lives in mills, factories and workshops, amid the ceaseless whir of machinery. The Indians weave beautiful shawls and carpets, and hammer and carve out beautiful brass pots and tables such as we all know and use in our homes. Their needs are few, and simple, like their lives.

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become ill if they stay long, so that English people have taken to going up to "the hills" in the hot weather, or, at least, to sending their wives and children to the hills if they have to stay behind themselves; and it is hardly safe to go out of doors, except early in the morning and late in the evening. For that reason, too, there are very few places where it is possible for English children to grow up strong and healthy; so that when Englishmen in India marry, they know that sooner or later they will have to send their children home to be brought up in England, and that their wives will often have to choose between being parted from their children and being parted from their husbands.

There are many great cities in India, of which the largest is Calcutta. In old times, and until quite a short time ago, the British people who were at the head of the Government in India used to live at Calcutta the year round; but now they live at Delhi during the winter and at Simla during the hot season.

THE GREAT RIVERS OF INDIA AND THE GREAT PORTS ON THEIR BANKS

Long before the Ganges reaches the sea, it divides into a number of rivers, one of which is called the Hoogli. The names of places in India are rather puzzling, because there are different ways of spelling them; but they are spelled here so that you can read them just as if they were English words, and then you will pronounce them as English people usually pronounce them; only you must remember generally to sound the letter *a* either the same way as in *call*—for instance, in Bengal; or as in *can't*—for instance, in Penjab.

Ships can sail up the Hoogli, and so a place on the banks of the Hoogli became a port, which grew into Calcutta, as the port on the Hudson grew into New York. The second great port of India is on the west, at Bombay, which was given to Charles II of England by the Portuguese as part of the dowry of his bride, Catharine of Braganza. The third is Karachi, on the Indus. There are other harbors on the west coast, but none so large; and on the east no good ones at all, though ships can get fair shelter off Madras. When the gales, which are called "monsoons," blow, as they do regularly at certain seasons of the year, fleets cannot remain in safety on that part of the coast.

Most of the great towns in Europe and America have grown large either because they were ports to which foreign merchants came with their goods and from which merchants sent their ships, or because there are big "works" there for manufacturing something, like steel or cotton or pottery; and most of the people make their living by working at some industry or other of this kind, or by buying and selling the goods that are manufactured.

HOW THE GREAT AND BUSY CITIES OF INDIA GREW UP

But in India, most of the people make their living by tilling the soil, which grows rice or wheat or millet. There the big cities grew up because emperors and kings found they were convenient places to build their palaces in, as they could be well fortified; and as the kings lived there with their courts, men collected round them, that the people of the court might buy their goods, and that they might be protected against robbers or the raids of enemies. And other cities grew up on spots which were held sacred, as sometimes in Europe towns grew more quickly where there was a famous cathedral or abbey. So that the largest towns, except the few ports, were generally at one time either the capital of a kingdom, or places to which people went on pilgrimages, or strong fortresses.

In India, although, compared with the size of the country, there are few big manufacturing centres, yet 35,000,000 people are engaged in weaving cotton cloths, mostly in Bombay and Ahmedabad. Cotton and jute are the chief manufactured exports. Jute is grown and manufactured in the neighborhood of Calcutta and there is some making of woolen goods, shawl and carpet weaving, and silk weaving.

DELHI AND THE PEACOCK THRONE, AND AGRA WITH THE WONDERFUL TOMB

Of the old cities, the most famous of all is Delhi, because for many centuries the mightiest monarchs in all India reigned there—even for centuries before the great Moguls made themselves lords of India. To-day a new Delhi is being built, as the new seat of the government of India. There, in old times, was the wondrous peacock throne, gleaming with

ONE OF THE MOST REMARKABLE LIVING SCENES IN ALL THE WORLD

This striking photograph shows us one of the most remarkable sights to be seen anywhere in the world—the bathing of an immense crowd of people in water overflowing from the river Ganges, in northern India. The people believe that the water is sacred, and hundreds of thousands of pilgrims bathe in it, believing that some good will come to them.

precious stones, said to have been worth millions of pounds. A conqueror came and carried it away, and the jewels were scattered. But the most beautiful buildings in India are at a much younger city—Agra. There are people who think that the Mohammedan mosque, or temple, called the Pearl Mosque, or the Moti Musjid, and a fine tomb called the Taj Mahal, are the most beautiful buildings in the world. The Taj, which is perhaps the most famous building in India, was built by one of the Moguls, named Shah Jehan, as a memorial to the wife he loved, who lies buried under its dome with Shah Jehan beside her. Here also Shah Jehan built the White Palace.

THE KIND OF PEOPLE YOU WOULD MEET IN A WALK IN INDIA

Now think of this—that if you traveled all over India and saw all the people there, not so many as one in every thousand would be white. That is to say, all the natives have brown skins—some dark brown, some light brown, but all brown; and there are a thousand natives for every European. Out of them all, very few indeed are Christians; the religion of nearly three-quarters of them is Hinduism, and nearly one-quarter are Mohammedans, or, as they are often called, Mussulmans.

The Mussulmans believe in the teaching of Mohammed, who, they think, was a prophet sent by God. A great many of the Mussulmans—most of them perhaps—belong to races which have fought their way over India as conquering armies some time or other during the last thousand years. Some of these are Moguls, or Turcomans; more are Afghans, or Pathans. (Remember to pronounce the two *a's* in each of those words just as you pronounce the *a* in *pass;* and also to pronounce *t* and *h* in Pathans separately, as in *at home,* not together, as in *the.*)

THE GREAT DIVISION BETWEEN THE MUSSULMAN AND THE HINDU

These Mussulmans think of themselves as soldiers, descended from a race of victorious soldiers, who have been rulers of the country in the past, and there is a great division between them and the Hindus, whom they look upon as infidels. Hindus and Mussulmans keep separate; they do not marry each other, and in many parts of the country, even under British rule, they can hardly be kept from fighting each other.

Most of the people in India, however, are Hindus, just as most people in Europe are Christians; but there are differences in the religion of Hindus, just as there are among Christians. According to the Hindu religion, there are an immense number of gods, and different gods are held in honor in different parts of the country and among different classes of people, who believe that they are under the protection of this or that particular god. Some of these gods are worshiped with strange rites, and some used to be worshiped with rites that were even horrible, until they were forbidden by the British. Men and women used to torture themselves hideously, thinking to please the gods thereby. English people used to believe that at the festival of one of these gods called Juggernaut—which was only one of his many titles, and meant Lord of the World—the Hindus threw themselves down before the great car on which the idol was dragged from one temple to another, thinking that if they were crushed to death under the car they would win happiness in the life hereafter; but that was not really true.

TERRIBLE THINGS THAT HAPPENED IN THE PAST, AND THE CUSTOM CALLED "CASTE"

Perhaps it was believed because people really did die from their exertions in dragging the car. But the "car of Juggernaut" has become a proverb. Great temples, or shrines, were built long ago in honor of some of these gods, which have in them wonderful carvings and idols or images.

Less than a hundred years ago there was a practice among the Hindus which seems to us very shocking. When a man died, his body was burned, but the custom was for the widow, if she wished to be praised and to be remembered for her virtue, to burn herself alive on her husband's funeral pyre. And because this was supposed to bring some great good to the husband in the life to come, the widows were often forced to do this by the dead man's kinsfolk. This was called "suttee." It is never done now, however, because it was stopped by the British.

The most remarkable and important custom among the Hindus is what is called caste. In ancient times there

An island shrine on the Lake of the Golden Lilies at Madura, a city and district in the Madras Presidency. Madura was formerly the capital of a dynasty which ruled over this part of India from about 400 B.C. to 1000 A.D. It has a great temple wherein is a sculptured hall with a thousand pillars.

This tomb with the stately approach, often called the most glorious building in the world, is the famous Taj Mahal at Agra, built by the Mogul Emperor Shah Jehan, as a memorial to his wife. He lies buried beside her.

were four divisions among them, each of which kept separate from the others, and married wives who belonged to their own division, or caste; and the children were of the parents' caste. The priests and teachers belonged to one caste, who were called Brahmins; and the soldiers to another. These, and also the third caste, were parts of a race which conquered most of India; but the fourth caste were considered as base-born, because they belonged to the conquered peoples; and the conquerors imagined that they themselves were not only superior in this world, but would be superior also in the next life. Among themselves they supposed that the Brahmins were superior to all the others, and the warriors to the third caste. If a man broke certain laws, however, even if he were not really to blame, he was degraded from his own caste and became no better than one of the base-born; therefore it was held to be a very terrible thing to lose caste.

THE GREAT NUMBER OF SMALL PARTS INTO WHICH THE PEOPLE ARE SPLIT UP

But afterward, each of these great castes broke up into a number of smaller castes, which are just as particular about not marrying into other castes. High-caste people will not touch food that is cooked by people of low caste; and if people eat certain kinds of food, or if they cross the sea, or if they do many other things which seem to us not to matter at all, they lose their caste, and can only save themselves by suffering certain punishments. There is nothing the Hindu fears so much as doing anything which will cause him to lose caste, and there has often been trouble because of Europeans forgetting how much they think about it, and making rules for soldiers or giving orders to servants against the caste rules.

There are some animals, too, which the Hindus look upon as sacred. The most sacred of all is the cow, so that to kill or injure a cow is a terrible sin in the eyes of a Hindu. But the Mussulmans think it sin to hold animals sacred, or to pay honor to images and idols, for the Mohammedans worship the true God, as the Christians do; but because Christians believe that Christ is the Son of God, and that Mohammed was simply a great leader of men, the Mohammedans think that Christians and Jews are really no better than heathens and idolaters. But Hindus think that Mussulmans and Christians, being of no caste, are no better than their own lowest caste.

HOW THE BRITISH RULE OVER THE VAST EMPIRE OF INDIA

Over all these people, Hindus and Mohammedans alike, the British Government exercises some supervision, though 72,000,000 are ruled by their native princes, generally called Rajah or Maharajah. These princes have their own armies within certain limits. A British resident or agent is placed at each court to give advice and represent British interests. The remaining 250,000,000 are under direct British control, although much responsibility has been placed on the people of India by "the increasing association of Indians in every branch of the administration, and the gradual development of self-governing institutions with a view to the progressive realisation of responsible government in India." The quotation expresses the purpose which the British Parliament has in view as regards India.

It has begun by placing a large number of questions of government called "transferred subjects" under the control of popularly elected Legislative Councils of the different provinces, while certain "reserved subjects" are dealt with by the Governor's Council.

But there is also, in England, besides the Provincial Council in eight provinces, a general Indian legislature with eleven departments after the manner of government. As a second Chamber there is a Council of State with not more than sixty members, of whom not more than twenty must be officials; and there is a Legislative Assembly of 144, of whom 103 are elected. The Governor-General has what we should call a Cabinet, but in India it has the name of the Governor-General's Elective Council.

It is still left possible, however, for the British Parliament to set aside the decisions of the Indian Legislature; and the Secretary of State for India in the British Government at home has final control of all Indian business.

Thus, India is given a large degree of power for shaping her own laws and administering them, but safeguards are still retained against the mistakes of inexperience or unwisdom.

THE NEXT STORY OF ALL COUNTRIES IS ON PAGE 2821.

Photo, Metropolitan Museum of Art.
The Horses of Diomed. Gutzon Borglum, Sculptor.

HOW ALCESTIS GAVE HER LIFE

CONTINUED FROM 2322

WAY back in the misty days of the Greek gods Apollo had a son who was so great a physician that he could raise the dead to life. This made Zeus angry, that any man should have a power great enough to set at naught the decrees of the gods. Whereupon he had made a mighty thunderbolt with which he slew Æsculapius, for such was the name of this son of Apollo, the physician so great that he could bring the dead back to life. (On page 3234 you may read more about the god Æsculapius.) Apollo avenged the death of his son by slaying the Cyclops who forged the thunderbolt. Zeus in great wrath at his son Apollo then passed upon him this sentence, that for the space of a whole year he must descend from the high sphere of the gods and serve a mortal man. Thus it was that Apollo came humbly to tend the sheep of Admetus, king of Thessaly, just and fair; the king did not know that this shepherd was a god.

After a time Admetus fell sick unto death. Then it was that Apollo interceded with the fates who order the life and death of men, and pleaded for the life of his master; but this was all the fates would grant, that Admetus might live on one condition only, that someone be found willing to die in his stead. Father and mother, kinsmen and friends, all were asked, but none could be found who was willing to die, save alone Alcestis, his beloved and beautiful wife. Out of love for her husband she was willing to give her own life.

The day was appointed on which she was to die, and Death came duly to fetch her. But as he came he found Apollo, bow in hand, before the palace gate.

"What dost thou here, Apollo? Is it not enough that thou hast kept Admetus from his doom? Wouldst thou now save this woman with thy arrows and thy bow?"

"Mind not," the god gave answer, "for justice is on my side."

"If thou hast justice, what need of arrow and of bow?"

" 'Tis my wont to carry them."

"Nay, 'tis thy wont to help this house 'gainst the right and law of Death."

"Nay, but I was troubled for one I love, and I fain would help him."

"I know thy cunning and thy fair speech, but this woman thou shalt not take from me."

"But consider, one life only mayest thou take. Wilt thou not take another in her stead?"

"Her, and her alone, will I have, for when I youth and beauty take, the greater is my honor."

"I know thee well, and all thy relentless ways. But there shall come to these snowy plains of Thrace, even as guest to this house, one sent to fetch the horses of Diomed. Haply he may persuade thee."

"Nothing shall avail. And now I go to cut off a lock of her hair, for I ever take these first fruits of them that die."

Within the palace Alcestis prepared herself for Death. First she bathed herself with pure water from the running river, and then she took from her coffer of cedar her fairest apparel and adorned herself therewith.

Then before her hearth she prayed: "O Queen Hera, behold I depart this day. Do thou keep my children, giving to the one a noble husband, and to the other a loving wife."

Then all the altars of the house she visited, crowning them with myrtle and praying at each. Nor did she weep, nor was she ever pale. But at last, when she came to her chamber, she cast herself on her bed and kissed it, crying: "I hate thee not, though I die for thee. Thou another wife may possess, not more true than I, but maybe more fortunate!"

And after she had left her chamber, she returned to it again and again with many tears. Her children all the time clung to her garments, and first the one and then the other she took in her arms and kissed tenderly. All the servants of the household followed after their mistress with loud lamentation, nor did she fail to hold out her hand more than once to each, even to the humblest.

When the hour came when she must die, her husband held her in his arms as though he would stay her that she might not depart. But she cried out: "Release me, for I see the boat of the dead. Charon stands with hand upon the pole saying, 'Hasten; thou delayest us.' " And when he would not let her go, she cried again: "Go I must, for a winged messenger of the dead looketh at me from under dark eyebrows and reacheth for my hand to lead me away. Dost thou not see him?"

Then as she would depart she gathered strength and said to the king: "I would tell thee before I die what I would have thee do. Thou knowest how I have given my life for thine. For when I might have lived, and had as husband any of the princes of Thessaly and dwelt here in royal state, yet could I not endure to be widowed of thee and see my children fatherless. Do thou therefore make this recompense. Thou lovest these children even as I love them. Suffer them, then, to be rulers in this house, and bring not a stepmother over them who shall hate them and deal with them unkindly. A son, indeed, hath a tower of strength in his father. But, O my daughter, how shall it fare with thee? For thy mother will not give thee in marriage, nor be with thee, comforting thee when a mother most showeth kindness and love. And now farewell, my children! Farewell, my husband dear! The gods order all. So be it!"

Then Admetus made answer: "Fear not, for it shall be as thou wilt. I could not find another wife fair and true like unto thee. Never again shall I gather revelers in my palace, or crown my head with garlands, or hearken to the voice of music. Never shall I touch the harp or sing to the Lydian flute. But, oh, that I had the voice and the melody of Orpheus! Then would I go to the depths of Hell and persuade the queen thereof or her husband by my song to let thee go; nor could the watchdog of Pluto nor Charon that ferrieth the dead hinder me from bringing thee back to light. But do thou wait for me there, for there I will dwell with thee. Never was wife so true as thou."

Then said Alcestis: "Take these children as a gift from me, and be as a mother to them."

"Alas," he wept, "what shall I do when bereaved of them?"

"Time will comfort thee," she replied; "the dead soon become as nothing."

"Nay, but I must depart with thee."

To which the queen made answer: " 'Tis enough that I go in thy stead."

And when she had thus spoken she de-

parted, leaving all in tears, inconsolable of grief.

Then the king said to the old men that were gathered to comfort him: "I will see to the burial. Do ye chant a hymn to the God of the Dead. And to my people I make this decree, that they mourn my beloved spouse by clothing themselves in black; they shall shave their heads, and such as have horses shall cut off their manes; there shall not be heard in the land the voice of the flute or the sound of the harp."

Then the old men sang their hymn to the dead straightway, and as they were finishing the chant it so befell that Hercules, who was on a journey, presented himself at the palace gate and asked whether the king were sojourning there.

The old men answered, "Even so, Hercules"—for they recognized him—"but what bringeth thee to this land?"

"I am come of an errand to fetch the horses of King Diomed."

"How wilt thou do this? Dost thou know this Diomed?"

"I know naught of him, nor yet of his land."

"Thou wilt not master him nor his horses without great blows, the like of which none yet has been able to deal."

"Even so, yet I may not refuse the tasks set me to do."

"Thou art then resolved to do this thing or die?"

"Ay, and this is not the first race I have run."

"Thou wilt not easily bridle those horses."

"Why not? They breathe not fire from their nostrils, nor yet devour the flesh of man. Such is the food of wild beasts, not of horses."

"Yes, 'tis true, yet wilt thou see their manger foul with blood."

Now King Admetus came forth from his palace with shorn head as one who mourned for the dead, and greeted Hercules, begging him to become his guest. Hercules inquired whether the children were well and also as to his father and his mother. What of his wife? He answered so that Hercules understood not. The king said he was burying a stranger by blood yet near in friendship, and that she had dwelt in his house, having left an orphan.

Hercules wished to depart and find entertainment elsewhere. But the king suffered him not. To the servant who stood by he said: "Take thou this guest to the great guest-chamber and set great abundance of food and drink before him. But shut well the doors between, for it is not meet that the guest at his meat should hear the cry of them that mourn."

The old men understood not how the king, with so great grief upon him, could entertain a guest.

"Would he have commended me the more had I caused him to depart from this house and from this city? My grief had been not one whit less and I had lost the grace of hospitality."

Now, when all was quite ready for the burial of Alcestis there came the old father of the king, with many servants bearing rich gifts of adornment with which to do honor to the dead. He advanced to the bier where the dead queen lay, saying: "I am come to mourn with thee, my son, for thou hast lost a noble wife. Thou must be brave though this be hard to endure. I bear adornments, for it is fit and seemly thus to do for her honor who died for thee, and for me also that I should not go down to my grave without a child to inherit the kingdom." Then turning to the dead, he said: "Fare thee well, noble life that hast kept my house from falling. May all be well with thee in the dwellings of the dead!"

Then did the king answer him in great wrath: "I did not bid thee come to this burial, nor shall my dead be adorned with any offering of thine! Who art thou that thou shouldst bewail her? Surely thou art no father of mine. Thou at the end of thy days wouldst not give the remaining few for a son, but sufferest this woman, a stranger in blood, to die for me. Her I count as father and mother also. And I am left alone, bereaved of her I love, to live out my life in tears and misery. Have I not always done due reverence to thee and to my mother? And lo! this is the recompense thou makest me. Make haste and raise other sons to nourish thee in old age and pay thee honor when thou art dead, for I will not bury thee. To thee I am dead."

Then the old man and the king reproached each other in unseemly anger over the bier of the dead, and the old man was obliged to depart with his servants bearing the rejected offerings after him.

Then was Alcestis carried forth to her burial.

While the burial of Alcestis was going

on strange things were happening in the palace. The old man left behind in charge of the guest-chamber came forth from serving the guest, saying: "Many guests have I seen in the palace of the king, guests from every land under the sun, but never an evil one like this. Well he knew my lord to be in sore sorrow, which knowing he should never have entered his gate. And then he took his entertainment in such unseemly fashion; if he lacked aught, he would loudly call for it, and then, taking in his hands a great cup wreathed in ivy, he drank strong red wine. And when he had well eaten and drunk, he crowned his head with myrtle boughs and sang in vile fashion without thought for the sorrows of my lord and the lamentations of us servants for our mistress. But I suffered not this stranger to see my tears, for so my lord had commanded. Surely it is a grievous thing that I must entertain this unfeeling stranger. Meantime they have taken my mistress to her grave, and I followed not after her, nor reached my hand to her that was as a mother to all that dwell in this place."

As the aged servant was thus lamenting Hercules came forth from the guest-chamber crowned with myrtle and flushed with wine, singing lustily. He cried out to the servant: "Ho, there! why lookest thou so solemn and full of care? Thou shouldst not frown on thy guest after this fashion, being full of some sorrow that touches not closely. Come hither and I will teach thee to be wiser. Knowest thou what manner of thing the life of man is? I trow not. Hearken therefore! There is not a man who knoweth what a day may bring forth. Therefore I say, make glad thy heart; eat, drink, count the day that now is to be thine own, but all else to be doubtful. As thou art a man, be wise after the manner of a man; for to them that are of a gloomy countenance life, if I judge rightly, is not life, but trouble only."

To which the servant replied: "All this I know; but we have fared so ill in this house that mirth and laughter ill beseem us."

"But they tell me this dead one was a stranger. Why shouldst thou be so troubled, seeing that they who rule the house still live?"

"How sayest thou that they live? Thou knowest not what we endure."

"I know unless thy lord hath strangely deceived me."

"My lord is given to hospitality."

"And should it hinder him that there is some stranger dead in this house?"

"A stranger, sayest thou? 'Tis passing strange to call her thus."

"Hath, then, thy lord suffered some sorrow he told me not?"

"Even so, else I had not loathed to see thee at thy revels. Thou seest this shorn hair and these black robes."

"What then? Who is dead? One of thy lord's children? His aged mother?"

"Stranger, 'tis the wife of Admetus who is dead."

"What sayest thou? And yet he gave me entertainment?"

"Yea, for he would not turn a guest from his door."

"O miserable man! what a wife hast thou lost!"

"Ay, and we are lost with her!"

"I saw the tears in his eyes and his shaven head and his sorrowful manner. How could he so have deceived me saying she was a stranger! Because of that did I enter his doors and make merry, and crown myself with garlands, not knowing what had befallen him. But tell me, where doth he bury her? Where shall I find her?"

"Follow straight along the road that leadeth to Larissa and thou shalt see her tomb in the outskirts of the city."

Then said Hercules to himself: "O my heart! thou hast dared many great deeds before this day. But now, most of all, must I show myself a true son of Zeus. I will go and watch for this black-robed king—even Death. Methinks I shall find him nigh unto the tomb drinking the blood of the sacrifice. There will I lie in wait for him, and run upon him, nor shall anyone deliver him out of my hands till he have given up to me this woman. But if it chance that I find him not there, and he come not to the feast of blood, I will go down to the queen of Hell, to the land where the sun shineth not, and demand her of the queen that I may give her back to her husband. Right nobly did he entertain me, for all that he was stricken with so great sorrow. Is there a man in Thessaly, nay in the whole land of Greece, that is so great a lover of hospitality? I trow not. Noble he is, and shall know that it is no ill friend to whom he hath done this thing."

So Hercules went his way. And when he was gone, Admetus came back from burying his wife, a great company following and seeking to comfort him. When he was come to the gate of his palace, he cried: "How shall I enter thee? How shall I dwell in thee? Once I came to these gates with many pine torches from Pelion and the merry music of the marriage song, holding in my hand the hand of her who is dead; and after us followed many who magnified us, so noble a pair were we. And now with wailing instead of marriage song, and garments of black for white wedding robes, I go desolate to my couch."

But while he yet lingered before the palace out of dread to enter alone, Hercules returned, leading with him a woman heavily veiled. Addressing the king he said: "Though I deem myself worthy to be counted thy friend, yet thou saidest not that thy wife lay dead in the house, but sufferedest me to feast and make merry. For this I blame thee. And now I will tell thee why I have returned. I pray thee, keep this woman against the day when I shall come back from the land of Thrace bringing the horses of King Diomed. And if it should fare ill with me, let her abide here and serve thee. Not without toil came she into my hands. And now I would have thee keep her, for which thing haply thou wilt one day thank me."

To this the king answered: "I meant no slight when I hid this truth from thee. Only it would have been for me sorrow upon sorrow hadst thou gone to the house of another. But as for this woman, I would have thee ask this thing of some prince of Thessaly that hath not suffered such grief as I. I could not look upon her without tears. Add not, then, this new trouble. And also how could she, being young—for young I judge her to be—abide in my house? And of a truth, lady, thou art very like in shape and stature to my Alcestis that is dead. I pray thee, take her from my sight, for she troubleth my heart and my tears break forth afresh with beholding her."

Then said Hercules: "Would I had such strength that I could bring back thy wife from the dwellings of the dead, and put her in thy hands!"

"I know thy good will, but what profiteth it? No man may bring back the dead."

"Well, time will soften thy grief which is yet new."

"Yea, if by 'time' thou meanest 'death.'"

"But a new wife will comfort thee."

"Hold thy peace; such a thing cometh not into my thoughts."

"What? Wilt thou always keep this widowed state?"

"Never shall woman more be wife of mine."

"What will this profit her that is dead?"

"I know not, yet had I sooner die than be false to her."

"Yet I would have thee take this woman into thy house."

"Be it so; they shall take the woman into the house."

"I would not have thee intrust her to thy servants."

"If thou so thinkest, lead her in thyself."

"Nay, but I would give her into thy hands."

"I touch her not, but my house she may enter."

"'Tis only to thy hand I will intrust her."

"Thou compellest me to this against my will."

"Stretch forth thy hand and touch her."

"I touch her as I would touch the Gorgon's head."

"Hast thou hold of her?"

"I have hold."

"Then keep her safe, and say that Hercules, son of Zeus, is a noble friend. Lift the veil and see if she be like thy wife, and change ever sorrow for joy."

And when the king looked, lo! the veiled woman was none other than his wife, Alcestis!

Whom Jove's great son to her glad husband gave,
Rescued from death, though pale and faint.

Thus in that house where mourning had veiled all the brightness of life, suddenly there was a return of joy and gladness. Where tears and sighs had been, smiles and laughter now had place. No longer were mirth and song and merry jest grievous and unseemly there. Nor ever was the son of Zeus forgotten there.

Gladness be with thee, helper of our world!
I think this is the authentic sign and seal
Of godship, that it ever waxed glad,
And more glad, until gladness blossoms, bursts
Into a rage to suffer for mankind.

THE TALLOW DIP AND THE BLACK SALT

RATHER more than two hundred years ago Lady Edgeworth, the beautiful young wife of Sir John Edgeworth, lived with her husband at a place in Ireland called Castle Lissard. In those days there were no trains and the roads were bad, so that little traveling was done and many people lived in the country all the year round. The men would hunt and shoot and fish, or, if they were good landlords, look after their tenants, while the women of the family prided themselves upon their preserves and linen cupboards and the general comfort of the house.

There was much disturbance in Ireland at this time and very little law and order. The highways were infested with lawless men, and people who lived far from the cities often had their houses attacked, their goods stolen, and they themselves were sometimes injured. This was the usual order of things, however, and people were so accustomed to it that men and women alike were trained to act with coolness in time of need. One Christmas time it happened that Sir John and Lady Edgeworth were entertaining guests, although they knew that their house might be attacked by a party of highwaymen who were holding that part of the country in terror. In readiness for their coming a barrel of gunpowder was always kept in a loft and the guns were stacked ready for use.

One evening the alarm came. The men rapidly got their guns, and while they hurried to secure window shutters and slip heavy bolts on the doors and post sentries at various points, Lady Edgeworth went up to the loft to bring down some powder. In those days there were no cartridges, but you had to drop the powder into the barrel of the musket and ram the bullet down with a ramrod.

As she hurried up the dark old staircase she saw a stooping form in one of the corners and recognized Biddy, the new little maid-servant who had but recently arrived from the city and was frightened out of her senses by the thought of robbers.

Lady Edgeworth pretended not to notice her alarm.

"Come, Biddy," she called, "carry this light for me." And the little maid ran to her with relief and took the light, which was nothing better than a spluttering tallow candle, without a candlestick, as was common enough at that time. Together the two women mounted the shallow stairs to the gallery which ran around the main hall, and then Lady Edgeworth opened one of the many doors which gave off from the gallery. A steep flight of wooden stairs leading up into gloom and cobwebs appeared, and a curious smell floated out upon the air. The young girl shivered and hung back, but her mistress merely laughed at her tremors, and taking the candle, led the way up to the loft.

Biddy knew nothing about gunpowder, and Lady Edgeworth did not explain what she was in search of, for she knew that it would only increase the girl's terror. Yet when she had got halfway down the stairs again she looked back and saw Biddy behind her with no candle.

"Biddy," said Lady Edgeworth, with a curious sinking feeling, though she spoke quite calmly, "where's the candle?"

"Sure and I left it," says Biddy, "sticking in the barrel of black salt. I'll go fetch it!"

Now, even the kind of wax candle that we use would have been dangerous enough, but the old tallow candles shed sparks much more easily. If a spark from that candle reached the "black salt," there would be a fearful explosion; half the house would be blown down and many lives lost. As quick as a flash Lady Edgeworth decided what to do. She turned and bade the wondering little maid go quickly down, and then darted upstairs again to where the candle stood spluttering and flaring on top of the barrel of gunpowder.

There was not a fraction of a second to lose and the brave young wife did not hesitate: she lifted the candle with firm fingers and, shading it with her hand, carried it calmly out of the room. Neither she nor anyone else was hurt, so her golden deed was by no means in vain. The heroine herself lived to be ninety years old and was the ancestress of Maria Edgeworth, whose books on Irish life and manners suggested to Sir Walter Scott his pictures of Scotland and to Turgenev his studies of the Russian peasant.

THE NEXT STORY OF GOLDEN DEEDS IS ON PAGE 3063.

Anatole France, by Carrière.

A Study, by A. Besnard.

The Smoker, by Cézanne.

THE MODERN MOVEMENT IN FRENCH ART

CONTINUED FROM 2482

THE study of art is at all times concerned with the expression of something most difficult to express—an abstract ideal. And there are certain kinds of painting which it would seem only artists can understand, because the ideal lying behind them is too remote for everyday people to grasp.

We ourselves have to go to school, to attend to our daily work, as the years go by, seizing every chance of learning a little more about this and that. How can we understand at a glance work upon which men have concentrated the gifts and energy of a lifetime?

There is no period in the story of European art which seems less easy to understand than that of to-day. This is partly because art has joined hands with science and partly because painters have gone to extremes—sometimes in reaction against the former generation and sometimes in working out their own ideas.

There were, we remember, the naturalists, led by Courbet and Manet, who rebelled against the artificiality of the classicists and romanticists. Naturalism developed into plein-airism—the painting of landscape and figures in landscape, actually out of doors. This meant the solving of the problem of shape and color plus light.

The next movement, led by Claude Monet, was the study of light itself. We remember that the movement was given the name impressionism. In the course of a generation there was scarcely a studio in Europe that did not show the influence of Monet's teaching.

The extreme painters of this movement carried their study of the phenomenon of light to stages where, it would seem, art ceased to be and where scientific experiment, carried on with a brush and a few bright colors, took its place. The artists were concerned with theories and methods of using their materials rather than with giving expression to thoughts or ideals. The result was a great many canvases wherein was much brilliant light and little else. Pictures were painted which were really experiments in the use of pigment, and work of this kind should be looked on as the means and not the end of picture-making.

Some artists painted their pictures entirely in spots. The chief man to work in this way was Paul Signac, who is now the leader of a very individual school of painting in France. To-day canvases are painted in every conceivable way—in spots, streaks, waved lines, and in masses that have for us no apparent coherence or reason till we can understand the artist's thought.

Impression was thus the open door to a large and bewildering place where a certain class of artists seem to be wandering to-day. After Monet came Cézanne, Matisse, Renoir, Gauguin, Van Gogh, and many others who are already looked upon as men of "yesterday" by the present-day painters of France.

How the imagination helps us when we look at a picture

In thinking of their work we must remember a few definite points. The first is that these men were trying to attain to something in art by resolutely throwing aside the conventions of a former generation. If we think for a moment, we shall see that art is necessarily a matter of conventions. For instance, an outline drawing of a solid object is a conventional rendering of that object. We draw something approaching a circle on a piece of paper, and our imagination helps us to see that it is meant to be an orange. In nature, outline does not exist: it is merely a convention of art adopted to represent nature.

Accurate drawing and painting of form is also a convention, for no shape on a piece of flat paper can *really* represent a living person. The throb of life and movement in human beings, the rhythm of the earth's progress, the forces of the air, are all mysterious powers which affect the appearance of people; and in order to show these living, breathing beings the artist has to resort to the convention of form that imitates.

The freedom of thought of the artists of the new movement

To the men of the new movement it seemed that these conventions had failed. The first that they put on one side was accuracy of drawing. If they wished to draw, for example, a tree, a man, a dancing girl, they would paint something that had no actual resemblance to the tree, the man, the girl, but was the essence of forest life, of masculine strength, of a dancer's grace. Seeing that they were still working upon canvas or paper, a flat surface, they were obliged to use some sort of convention in representing solid, living objects; but the new convention they chose, after discarding the old, calls strongly on our imagination and reason in order to be understood.

For these artists depend upon suggestion to produce the atmosphere that will give the impressions they wish to make with their pictures. A very highly gifted actor or actress needs no elaboration of setting, but may stand upon the simplest of stages, and by the subtle charm of personality, aided by rare art, make an atmosphere of reality so convincing that we forget surroundings and feel ourselves in palace, cottage, garden or forest, as the case may be. So the impressionists would give us the "feeling," the spirit of their subjects, rather than the fact presented as in a photograph. A definite plan of thought underlies their work; it is not haphazard, as might appear. If they think the feeling or the swing of the lines is helped by distorting a natural object, they do not hesitate to paint it that way.

Another point to remember, in thinking of this new movement, is that painters began to draw objects and scenes which in themselves were not so pleasing as those generally shown in works of art. It has been generally accepted that only certain things are picturesque: for instance, a plow is picturesque; a new tin pail is not. If we saw a painting of a tin pail, our first thought would be: "But a tin pail is so ugly!"

That is prejudice. In just the same way did people greet the pictures wherein for the first time clumsy unwashed peasants were shown. The public had become used to seeing paintings of Greek goddesses, beautiful people out of legendary lore, men and women clothed in purple and fine linen. They looked at the peasants and said: "But these people are so ugly!"

Generations have passed, and these same peasants are accepted as picturesque. It is the mission of progressive art constantly to teach the lesson that nothing in itself is ugly.

What we can learn from the art of Cezanne

Of the group that followed Monet, the man who can teach us the most is Cézanne. Our love for the old art will not suffer by our learning to love Cézanne. He was perhaps more a landscape-painter than anything else, but in all his pictures, scenes of the countryside, still-life studies, and portrait work, there is the same strength, the same simplicity, the same perfect rhythm of line and space.

This last quality is not easy to understand. It means that the lines in a perfectly balanced picture have the same

PICTURES BY RENOIR AND DEGAS

THE WALK, BY AUGUSTE RENOIR

A DANCER, BY EDGAR DEGAS

MADAME CHARPENTIER AND HER CHILDREN, BY AUGUSTE RENOIR

Degas, a notable master of line, often shows mastery of light problems, too. Renoir has been called the most entirely French of the modern painters. From these pictures you can see how, as we have said, his compositions could be cut up into curved sections. The lower painting belongs to his middle period—his best. That Renoir, as well as Degas, felt the Japanese influence is shown in the lower background.

Lower picture, courtesy Metropolitan Museum of Art.

effect on the senses, through the eye, that the rise and fall of sound in great poetry has through the ear. It is because of this quality that Cézanne's pictures, strange though they may seem at first, grow more real every time we look at them.

If one of his landscapes is hung so that it must be looked at from close by instead of from a distance, as all impressionist pictures should be viewed, it seems to consist of a mass of shapeless trees and patchy roads, fields and hills. Seen from a proper distance, it explains itself.

To those who are stubborn in their demand that a landscape shall be photographic and abound in detail, Cézanne's picture, viewed near or far, will be distasteful. To those of a larger vision it

The Writing Lesson, by Auguste Renoir.

A Portrait of Himself, by Paul Cézanne.

cannot fail, sooner or later, to give pleasure. The apparent shapelessness and ruggedness are forgotten; the eye is conscious of a beauty of balance and management of space, a restfulness, a rhythm of repeating masses and lines. The feeling of the picture lies very near the feeling of life itself, wave following wave, day alternating with night, its pattern chiseled out of eternal, stable things.

This same feeling underlies Cézanne's portraits. Pictures like The Smoker, The Woman Sewing, Card Players, linger in the vision after the eye has passed by them.

Renoir, Gauguin, Van Gogh, Matisse are great names in this period of the new art, and each reflects in his own way its spirit. None of them has Cézanne's austere spirit and severity. It seems as if Cézanne's pictures could be cut up into angles; but Renoir's would have to be divided into curved shapes. That was Renoir's vision of beautiful things—powerful rounded masses slipping into each other with subtly repeated lines.

One of his most famous works, a portrait called The Girl with the Rose, in the Luxembourg Gallery, Paris, shows in itself Renoir's individualities. Another characteristic picture is his study of two girls watching a play; this, like the delightful painting of a child writing, is in a private collection. In his works we feel the "warm life of movement."

We have to remember, in looking at the work of the impressionists and post-impressionists, that some of these men allowed themselves any freedom in the treatment of shape and color which would help their design and purpose. If by the colors we call natural they could not express their ideas, they made free use of the most unnatural tints. For instance, in his portrait of the young sailor Matisse deliberately draws in the eyes with a bright green brush. The effect, of course, is startling; but the picture is an interesting scheme of color treatment.

Van Gogh is a strange figure in this group of men whose life-work it was to get the "new eye." Van Gogh was intensely conscious of life and nature and the forces that govern creation. And as by ordinary methods he could not express what he felt, he resorted to a strange manner of painting. He drew his pictures in masses of curving lines. It

THE QUAY AT ROUEN, BY CAMILLE PISSARRO

THE ROAD TO MOUNT VALERIEN, BY ALFRED SISLEY

seemed to him that something so full of life as the sky, the sun, the earth, could be expressed only by lines that seemed to be always moving and that are as nearly alive as a line on a canvas can be. In the few years that he was working he achieved a separate and distinct place in the new art; but his merits are more easily understood by his fellow-artists than by the public.

THE MEN OF THE NEW ART, WHOSE WORK IS HARD TO UNDERSTAND

The various kinds of painting which developed from the early impressionism is shown in the work of Degas, Carrière, Besnard, Rousseau, Pissarro, Sisley, Picasso, Utrillo and many others. A great many of the pictures seem worked out on the ordinary lines of impressionism; a large number, again, are most unusual and difficult to understand.

Carrière was an impressionist in his own way, loving dark, sad effects. Degas, who shows Japanese influence, has great ability as draftsman and decorator; as colorist he has a gift, but is more limited. His picture, The Beach *(La Plage)*, is a most interesting and vivid piece of work. The Dancer, in the Luxembourg, is famous; and other studies of girls dancing show what perfect mastery this artist had over the problems of drawing and figure construction. A picture of a very different kind shows two laundry girls ironing—a powerful study.

Among the younger men of the present day the new art in France has developed on strange and individual lines. The painters of the newest of the new art are like men speaking a language whose grammar and idiom are secret to a small community. A few words here and there we can understand, and that is all.

THE LINES AND FORMS THAT EXPRESS THE FEELINGS OF THE ARTIST

Like all the rest of European art, the new art is a matter of development of thought. It passed through several stages, beginning with the men of the later impressionists who did not mind by what methods they accomplished the pictorial representation of their new ideals. Then came a number of men who began to paint lines and shapes which were not intended to have any resemblance to nature at all, but represented something in the artist's mind. This was the definite break-away from all convention of treatment.

An artist of the group paints canvases which consist of lines—upright, slanting, horizontal, with cube and curved forms introduced. They seem to have no relation to any form of life at all; they are the direct product of the artist's brain, and in their apparently ugly and useless jumble they make plain his vision. And they are not put down haphazard: they are as definite a composition as any picture containing balanced masses of "real" figures, trees, natural objects.

The new artist of this group is engrossed with the beauty and poetry of the abstract line, of certain forms of light and intense color. To put it rather crudely, it is not so much that he is painting shape and color as that he is expressing the feelings and thoughts that abstract forms, lines, and colors call out in him. Certain kinds of lines—tending to the horizontal—express peace and quiet; rising and "moving" lines show stages passing from happiness to gaiety and noise. And, again, some colors in themselves express warmth and joy; others sorrow and gloom, death.

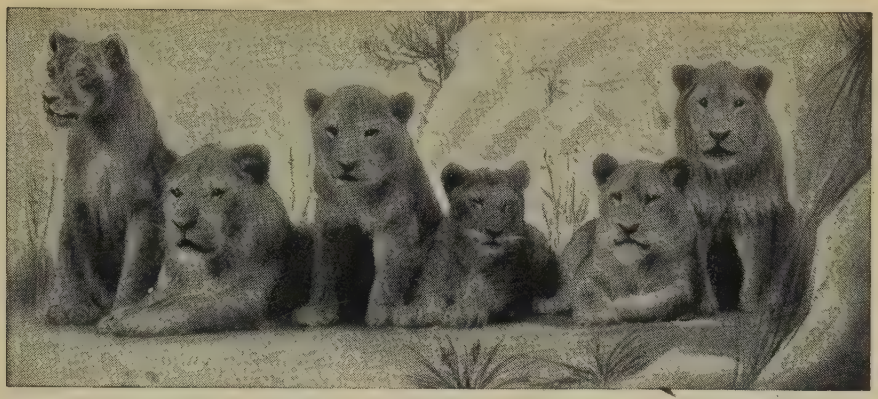
WILL THE NEW ART DIE OUT, OR IS IT IN ITS INFANCY?

A great many pictures painted by the exponents of this form of the New Art seem to us either meaningless or barbaric and ugly. But if we fail altogether to understand them—and a little thought will save us from that—and honestly dislike them, let us at least pay to them the tribute we pay to the work of men whose lives are spent in expressing an ideal.

There are hundreds of painters working on various forms of the New Art in Europe to-day. But, though this movement cannot be denied by just pretending that it does not exist, there is no need to look on it as a final and permanent expression of art. In another two or three generations it may have rounded itself up and closed, as the Pre-Raphaelite movement did after accomplishing its work in England.

On the other hand, it may have developed into something we cannot foresee. The new art may be in its infancy. In any case, it has rendered a useful service to painting by its broadness and freedom, its getting away from the prettinesses and smallnesses which have nothing to do with great art, and which have a tendency to poison inspiration.

THE NEXT STORY OF THE FINE ARTS IS ON PAGE 2851.



HOW ARE ANIMALS MADE TO PERFORM?

CONTINUED FROM 2612

MOST of us have seen performances by animals at circuses or other places of amusement. In watching lions and tigers, bears, panthers or other powerful beasts in the arena, have we not felt a catch in our breath, a flutter of the heart, fearful that one of these creatures may turn and kill the man who is making them go through their tricks?

Sometimes one does do this. Every now and then we read that a trainer has been attacked by one of his pupils. On the other hand, many men and women go in and out of the cages for years and never get a scratch, though they compel the animals under their charge to go through a long list of tricks.

Animals are very different in their attitude toward man. Some seem to hate him, while others grow to have real affection for him. Some kinds of animals seem to like to perform, while others hate to obey. Individuals also differ a great deal. Some are stupid and cannot learn much. Others are lazy and object to exertion. Still others seem to like to do tricks of various sorts. Some of the great apes, for example, seem to watch their audiences, and are pleased at applause.

A full-grown elephant caught in the jungle will learn very quickly what is expected of him, but the training of other animals must be begun while they are young. In very few cases can a full-grown animal be taught very much. You may have noticed something like this. You have heard the old proverb "You cannot teach an old dog new tricks," and there is much truth in the saying.

The young animals are first taught to keep their places, not to fight one another, and to obey the trainer. Sometimes this is difficult, and no doubt some of the pupils are punished for disobedience. You may have read or heard that dreadful cruelties are practiced. If such stories are true, they are the exception, for if the animal lives in great fear of its trainer it will not perform well.

The trainer goes over the performance again and again. When the animal does well he will receive a bit of some food he likes, particularly such as a lump of sugar, a piece of fruit or a tiny bit of meat. The methods of a good animal-trainer are very much like those of a good manager of boys. He punishes disobedience, laziness or stubbornness, and rewards good work.

Some kind-hearted people object to seeing animals perform at all because they fear that they are cruelly treated. Performing animals are seldom worked hard—not half as hard as a horse or an ox, and very often they have an

easier time than they would have if turned loose to get their own livings. Certainly a street cat or an ownerless dog has a harder life. Of course the law should see that cruelty is not practiced. There is no excuse for that; and if any kinds of animals cannot be trained unless they are abused, the attempt to train them should be given up.

WHICH ANIMALS ARE THE MOST INTELLIGENT?

This question has been much discussed. Dr. Hornaday, of the New York Zoölogical Park, has made an interesting study both of the intelligence of different animals and of the ease with which they can be trained. He says that the chimpanzee is first in both lists, and that the orang-utan is not very far behind. The gorilla is much lower. The Indian elephant comes next to the orang-utan. Next in order is the horse, and the dog is very close to him. Both of these animals have gained much from living with man. The beaver has great intelligence, but cannot be trained at all. Lions are more intelligent than tigers or leopards, and are also more easily trained. The grizzly is the most intelligent bear, but cannot be trained so easily as the European brown bear. Wolves and foxes, though they have great intelligence, cannot be trained at all. The deer and the wild goats do not take much training. On the other hand, no animal can surpass the sea-lion in its feats of balancing, but it is not intelligent.

HOW IS IT THAT FISHES DO NOT DROWN?

All animals and plants must get air to live, or, to be strictly accurate, they must have a supply of oxygen, which is one of the gases in the air. Should this supply of oxygen fail, death must come, whether from drowning or from any other cause. What really happens when a man is drowned is that, on account of his being so long under water, his supply of oxygen has run short. This is not because there is no oxygen to be had in the water, but because human beings and animals breathing by lungs cannot make use of it. Their organs are adapted only for breathing air. The fishes, on the other hand, breathe by gills, not lungs, and the wonderful way in which gills are made enables them to extract the oxygen from the water. Being able to do this, they can live under water perfectly well. But if anything should happen to prevent the fish from getting oxygen from the water, or if the water were deprived of its oxygen, the fish would be drowned.

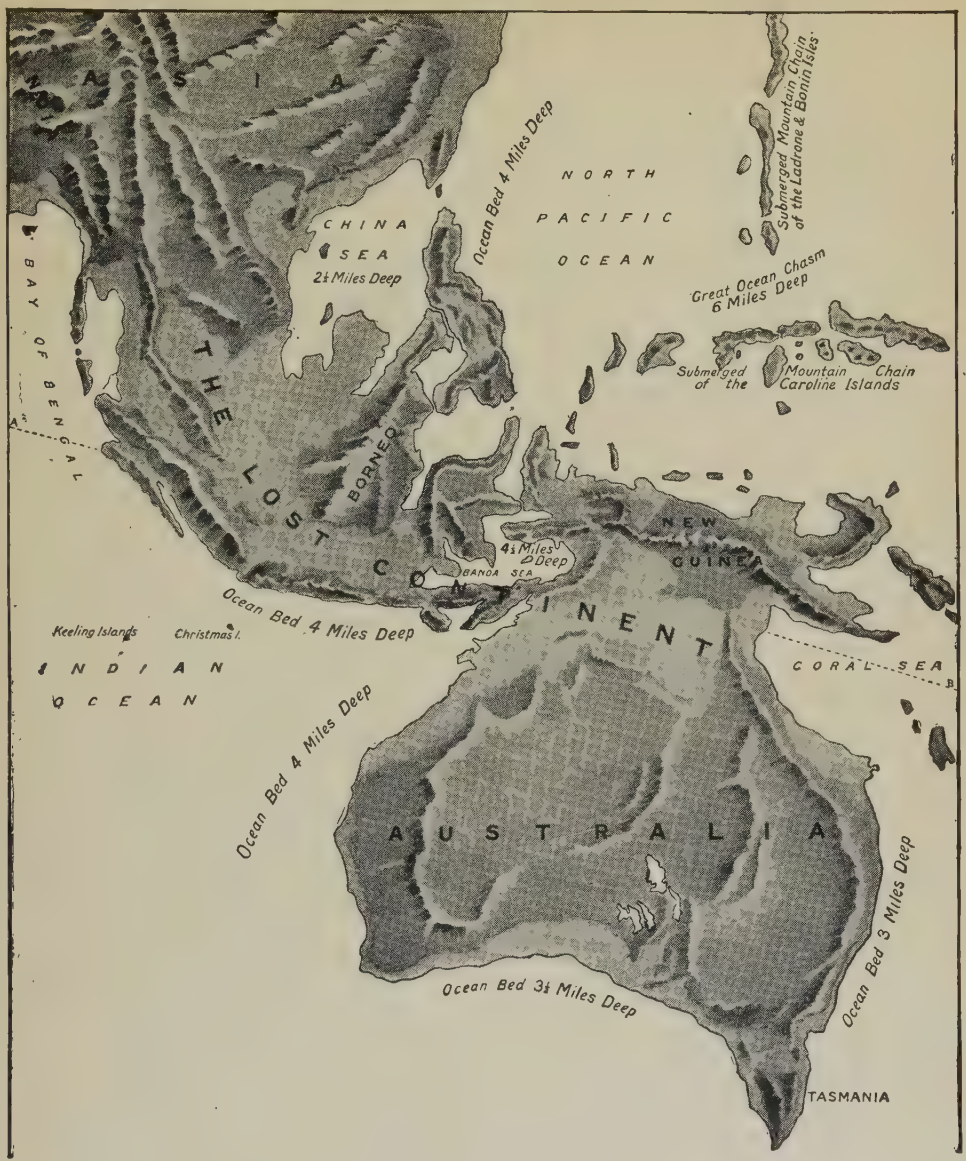
WHICH IS THE BEST STONE FOR BUILDING?

There is none. Much depends on the local conditions, the prevailing state of the atmosphere and the exact purpose for which the stone is to be used. What is the strongest and best stone for one district or for one purpose is not necessarily best for another. For example, the atmosphere of a manufacturing city is often charged with gases containing various acids, and these acids, caught by falling rain, are deposited on the buildings. If the stone is of a certain composition, the acids will eat it away. It is therefore important that the chemical composition of the stone should be learned before using it in such a situation. Even a hard and strong rock like granite may be unsuitable in certain districts owing to the chemical state of the atmosphere. The acid and salts in sea-water often bring about changes in the minerals composing the stone of a breakwater or a harbor wall, so that it is gradually eaten away. A stone of less apparent strength may last much longer in such a place because it is not acted on in this way.

But chemical composition is only one fact that has to be taken into consideration. The crushing strength of a stone is very important in certain circumstances. A rock consisting mainly of hard quartz grains may be very soft, while another rock with practically the same chemical composition may have the grains much more firmly connected together. That rock will stand weathering better.

It may even happen that the kind of stone that is best on one side of a building is not always the best on another side. Some stones show a tendency to decay when exposed to strong sunshine, though they are very enduring in shaded positions. This interesting fact has been noticed about some ancient cathedrals. York Minster, in England, built of magnesium limestone from Nottinghamshire and South Yorkshire, is more decayed on the south side than on the north. In some districts a stone on which lichens grow well proves more lasting than one on which these lovely plants do not thrive, as the lichens afford protection against some of the causes of decay.

WHAT IS THE LOST CONTINENT?



IF we look at a map of the world we see between Australia and Malaysia a great chain of islands, some large, like Borneo, and some very small; and geologists generally believe that these are the remains of a great neck of land which at one time, probably millions of years ago, united Asia and Australia, so that it was possible to pass dryfoot from one continent to the other. It is thought that millions of years ago all this land formed a mighty continent; but the land gradually sank and the sea rushed in, so that only the mountains remained above the water, and they now form the islands of the Pacific. But the lost land is not very

deep under the sea; and if the sea were to sink twelve hundred feet it would appear above water again, with deep sea on both sides of it. This is one of many similar changes which have taken place in the crust of the earth. Not so very long ago, geologically speaking, England and France were united; and at one time Europe and Asia were separated and Asia and America were joined. It is generally believed that at one time, too, there was a continent in the middle of the Atlantic, often spoken of as the Lost Atlantis.

WILL A SEED GROW AFTER THOUSANDS OF YEARS?

No. There are numbers of people who believe that seeds will grow after thousands of years. Seeds found in tombs with mummies have frequently been reported as sprouting and growing; nevertheless, it is quite certain that seeds retain their capacity of growth for only a few years. After even five years most seeds are dead and will not germinate. Whenever the cases have been investigated by scientists, the so-called mummy seeds which are supposed to have grown after thousands of years have always turned out to be fresh seeds which have been sold by fraudulent people. The simple truth is that there is no authentic case on record in which seed really thousands or even hundreds of years old have been known to grow. If the wheat is ancient, it does not grow; if it grows, it is not ancient. There are people who will give you long stories of mummy wheat and other mummy seeds which grew and flourished, but there is always a gap in their actual knowledge of the history of the seed, and the truth is that they are mistaken or have been misled.

HOW DOES SEAWEED TELL US WHAT THE WEATHER IS GOING TO BE?

Of course, seaweed does not foretell the state of the weather in any direct way; it merely tells us something which gives us some guidance as to the weather. A barometer, also, does not tell us about the weather itself, but, like the seaweed, it indicates something that has to do with the weather. As the barometer and the seaweed tell us different things, we should perhaps be able to know more about what the weather was likely to be if we used them both, and then noticed what usually happened when they did certain things. The barometer simply tells us how heavy the air is at any given time, and from that fact we can make certain guesses, more or less likely to be right, as to what will happen. The barometer tells us nothing else at all, even though we often call it a weather-glass.

The seaweed tells us nothing about the pressure, or heaviness, of the air at any given time, but it tells us about the moisture of the air and about that only; or perhaps, in a way, it also tells us a little about the warmth of the air, though we can feel that for ourselves. When a piece of seaweed feels very damp, it tells us that there is a good deal of moisture in the air, and rather more than the air can well carry, so that it is glad to unburden itself into the seaweed as far as possible. Now, that means that the air may very likely unburden itself soon on a bigger scale by means of rain. When the seaweed is dry, it means the opposite of this.

HOW DID MEN FIND THAT THERE IS COAL IN THE EARTH?

The coal-measures, as they are often called, form a layer in the earth's crust which is old and has had many other layers heaped up over it since the giant ferns that gave us our coal were alive. We do not expect to find coal at, or near, the surface. But various things happen to, and in, the earth's crust which sometimes have curious results.

Wind and rain, the action of the sea, and other causes not yet well understood may rub down and wash away the surface-layers in places, and then what is beneath, such as coal, may be revealed. Or sometimes there may be greater and perhaps much more sudden happenings in the earth's crust. They may be due to the action of the heat that is imprisoned beneath it, or to the breakage of a layer owing to the increased weight of the layers above it, or due to the production of heat by means of radium and the other elements which belong to the same group.

In this way there were possibly found certain curious and easily broken black stones which, unlike all other stones, would burn. This may have happened when men were quarrying or cutting a little distance down into the earth for some other purpose. Afterward it was found how the coal lay and in what part of the earth it is most readily obtained.

WHY DO SOME FACES IN PICTURES SEEM TO FOLLOW US?

Faces in pictures are either always looking at us, wherever we look at them

from, or else they are never looking at us, wherever we look at them from. The rule is very simple. If the sitter was looking at the painter or at the camera, then, wherever you stand, he will seem to be looking at you. If he was looking on one side, then, wherever you stand, he will seem to be looking on that side of you. This is amusing if you have a group of people who were all looking at the camera when they were photographed.

THE EYES THAT FOLLOW YOU EVERYWHERE
The eyes, in this picture by Van der Helst, seem to look at you always. That is because they were fixed on the painter when the portrait was painted.

If you look at the photograph from one side, they all seem to turn to follow you, and then to turn back if you look at it from the other side. But if they were not looking at the camera, you can never get them to look at you.

WHY DOES A VIOLIN STRING CHANGE ITS NOTE WHEN HELD DOWN?

The shorter a string the more quickly it vibrates when it is plucked or when a bow is rubbed across it. When you put your finger on a string this comes to the same thing as making the string shorter, and then, when the string is set vibrating, it must vibrate more quickly. One note is higher than another just because the air is trembling more quickly. If you stop the string just halfway along its length, it will give out a note exactly an octave higher than before—a high G instead of a low G, for instance. This is because the string now vibrates twice as fast as it did before, and the note made when the air vibrates twice as fast as it did before is exactly an octave higher. If you now halve the string again, you will get the G an octave higher still. If you tie one end of a piece of string and hold the other at different distances along, you will get just the same result as when a violin string is stopped. The wonderful thing is that so little pressure is required on the string to produce the effect of shortening it, and so getting a higher note. More wonderful still is the skill of the player who can learn to move his fingers along so as to get exactly the notes he wants.

WHY DOES A CAT ALWAYS FALL ON ITS FEET?

A cat which falls or springs from a height, great or small, generally manages to fall on its feet. That we all know. This wonderful feat is made possible by the way the muscles of the cat are arranged and the quickness of the cat's instinct for bringing them into play. No matter how a cat is dropped, it is usually able to turn over in the air and so twist itself that its feet shall come in contact with the ground. But the cat must be in health and vigor or the feat cannot be performed. Scientists say that if men could master the secret of the cat they also would be able to alight on their feet when falling. There is no reason why our muscles should not be as effective as the cat's. Many of us have seen men dive head foremost from a trapeze, turn somersaults in the air, and land safely. Others vault over the backs of horses, whirling round in midair as they go, yet dropping safely on their feet.

The secret seems to be the quick working of the mind; at any rate, scientists tell us that the ordinary man would have power to do as the cat does if he made up his mind quickly enough. Cats are the superiors of the ordinary man in this, and we can only wonder at the unerring grace and accuracy with which they come safely to earth. The ability of the cat to alight feet first depends on the healthy condition of its balancing-sense, the sense governed by the six little fluid-bearing canals, three in each ear, which enable us to balance ourselves as if they were so many little thinking spirit-levels. Now,

if they played any special part in the wonderful feat of the cat we should expect to find these balancing canals very highly developed; but they are not. They do not appear to be so perfect in the cat as in man, and neither man nor cat has them so beautifully organized as the bird. If the sense of balance in a cat is injured, the cat will fall as clumsily as a cow. Yet, on the other hand, we cannot say that there is any particular quality in the cat's balancing-sense alone to account for its exceptional ability. There must be something else. The power seems to arise from ages and ages of need to exercise this special art. Nature has enabled the cat to make special use of its balancing-powers in a particular direction. We cannot equal the cat in that, but we have learned to balance ourselves in an upright position when walking and running, and not even the clever cat can do that.

WHY DO WE FORGET SOME THINGS AND REMEMBER OTHERS?

Memory depends largely on the impression made on us by various incidents. The things we forget most easily are the things which do not strike us as being of much interest or importance. On the other hand, those things which appear as great events in our lives at the time are firmly fixed in our memories, and always remembered. Very often a trifling circumstance connected in some way with the great event is never forgotten.

WHY DO OUR FACES KEEP WARM WITHOUT CLOTHES?

It is chiefly a matter of custom. Our faces, exposed to cold, do get cold, but they do not *feel* cold, because the nerves by which we feel cold are accustomed to this state of things and take no notice of it. It is true of all nerves that they notice only differences from what they are accustomed to. We tolerate, without noticing them, degrees of cold to which we are accustomed in our face and hands; but we actually feel our feet cold if we expose them. Yet people who are accustomed to bare feet feel no more, and suffer no more, from them than we do from bare hands. On a winter day we may not notice that our noses and ear-tips are cold, but they *are* cold, though we may feel nothing. You soon find that if you put a warm hand against them; and the other proof is that they are very apt to get frost-bitten in cold climates. There is all the difference between *being* cold and *feeling* cold.

This law about custom, and the way in which nerves are affected by it, is one of the most important in the world, for it explains the way in which we learn to get accustomed to all manner of things, and it tells us why the countryman cannot at first sleep in the town on account of the noise, while the townsman often cannot sleep in the country on account of the silence. At last, however, the countryman gets used to the noise and the townsman gets used to the silence, and both sleep soundly. All we really feel is difference.

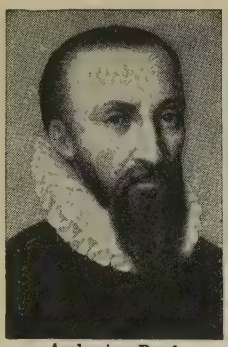
WHY DO SOME TREES FLOWER AND OTHERS NOT?

The flowers of trees differ widely in their size and prominence, so that, while we all know the flower of the horse-chestnut, we may never have noticed that the oak has a flower. Yet, if we could trace back the history of every acorn, we should soon find that the oak has a flower. The size and appearance of what we call a flower usually depend on the part we call the petals, but these are not necessary parts of a flower at all. There are many flowers that have no petals. All trees have flowers of some sort; they may be large or small, but they always exist, and new trees could not be formed without them, for the flowers bear the seed in which the new tree begins its own life. The whole world of plants may be divided into two great groups—those bearing flowers and reproducing themselves by them, and those which have no flowers and reproduce themselves in other ways. The flowering plants are much the highest in the scale, and are the ones in which we take the greatest interest, though some of the others are important.

WHAT BIRD HAS THE LONGEST WINGS?

The albatross, a sea-bird common in the seas south of the Equator, is said to measure sometimes seventeen feet between the tips of its outspread wings. It is a strong and tireless bird, and will sometimes follow a ship for days without alighting, so far as anyone can see. This is the bird about which The Rime of the Ancient Mariner was written. It lays only one egg, and both parents care for the young bird until it is able to look after itself.

THE NEXT WONDER QUESTIONS ARE ON PAGE 2871.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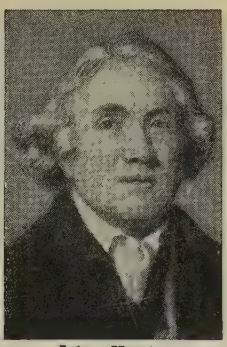
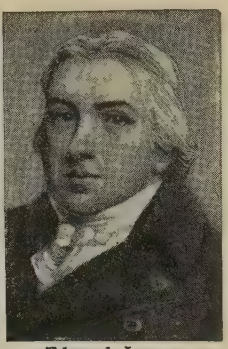
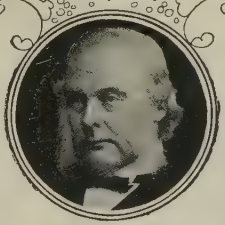

John Hunter.

Galen.


Edward Jenner.

THE WORLD'S GREAT DOCTORS

CONTINUED FROM 2589


Lord Lister.

FEW lives have been more important to the well-being of the world than those of the great surgeons and physicians. Without these men the human race must have been very much reduced by the many diseases fatal to man. Even to-day, in spite of science, pestilence carries off millions of people every year in India and elsewhere. But for the skill of the doctors similar conditions would prevail throughout the world. If North America had a death-rate as high as that of India, the land would be an empty wilderness in the course of a few years, as the birth-rate on this continent is lower than that of India. Our doctors not only cure us when we are ill: they teach us to observe laws which, if followed, will, generally speaking, keep us in health.

There never was a time in the history of man when there was no attempt made to heal wounds and diseases. We have no written books to tell us about the doctors of the old-time peoples, but the story is written for us in bones of men that have been found. Remains of men who lived thousands and thousands of years ago show us that many of these men sustained dreadful injuries, and that the doctors of those times cured their hurts. Skulls have been discovered from which damaged bone had been removed and new bone put in. A surgeon is able to tell whether the operation was successful. If he finds the new bone knitted to the old he knows that the surgeon succeeded in his task. We find not only broken heads that have been cured, but bones which show that injured arms and legs cut off by rough flint implements were healed in spite of the very crude treatment they received. But we find many other examples of operations which were not successful. The unknitted bone shows that the patient died, in spite of the attempts of his doctor.

What a wonderful story of the past these signs tell us! Men were savages, living by battle with one another. Their lives must have been desperately hard and cruel. Injuries to bones which we are able to say were those of women show that the women of savage days shared the battles of the men and were hurt as badly. The men and women fought for their flocks and herds, their pastures, their watering-places, the caves in which they lived. In these fights they inflicted and received terrible injuries from arrows and spears of flint, from hatchets of stone and from fragments of rock.

But the old-time savage man had some tenderness in his heart. He set the broken bones of his wounded kinsman, and the woman nursed the stricken warrior. For months, while injuries to head or limbs were healing, they had to feed and nurse the wounded. This they did, as we know from the signs which show that the injured recovered.

All this surgery was very rough and clumsy, and many, many centuries were to pass before men became skillful. Until quite recently it was supposed that surgery proper began with the Egyptians. The marvelous discoveries in Crete tell us of a wonderful civilization there, of sea-power and of military feats. These gave the Cretans a vast empire thousands of years before the birth of Christ. There must have been accomplished surgeons and physicians in that land long before surgery was supposed to have been known in Europe, and even before it was known in Egypt.

We must, however, go back to facts of which we are certain. Let us for a moment clearly distinguish between medicine and surgery. Surgery means the treatment and cure by operations of injuries to the body. The repair by medicine was largely superstitious practice—charms and incantations and all manner of nonsense. In surgery, however, they did remarkable things, considering the state of knowledge at the time. There exist papyrus documents dating from 3,500 years before Christ which make plain that at that time it was a common thing to practice quite difficult surgical operations. Surgical instruments have been preserved which were made in very early times in Egypt.

MOSES, A GREAT DOCTOR OF EGYPT, AND HIS WISE LAWS OF HEALTH

One of the first known doctors in early Egypt was not one of the sorcerer-surgeons of the pharaohs, but Moses, the great Hebrew leader. He did not cut off diseased limbs, nor did he with his own hands make medicine for the sick. But he had a wonderful knowledge of the laws of health. He made the Israelites follow a code of regulations for their cleanliness and well-being, which preserved them in health and vigor for the forty years of their wanderings in the wilderness, and remained a heritage of health to the nation afterward.

If the splendid laws for health which Moses drew up fourteen centuries before the birth of Christ could be enforced in our days in the cities and in all the lands over which the flags of freedom fly, they would save thousands of lives every year. There was no mystery about his methods. His laws, which are written in the Old Testament, are plain, sane rules of matter-of-fact science.

HIPPOCRATES, "THE FATHER OF MEDICINE"

After Moses the first great doctor whom we can name is Hippocrates, who was born about 460 B.C. He was a Greek, born in the island of Cos, off the coast of Asia Minor, which is famous as the birthplace also of Apelles, the great painter. For many generations his family had practiced medicine, and the people's attitude toward them gives us a curious insight into the mind of the time.

It was believed that they were descended from Æsculapius (or Asclepius), who, Homer says, was a skillful physician, and whom the Greeks revered.

The everlasting claim of Hippocrates to fame is this, that he took the human body in its health and in its disease, and once and for all separated the study of the body from superstition, declaring that it is a part of nature that men must learn to understand.

He was a close observer and a keen thinker, and he has earned for all time the title of "Father of Medicine." He truly founded and laid firmly in nature the foundations of the great science of health which is every day becoming more valuable to mankind. Says Wordsworth:

> To the solid ground
> Of nature trusts the mind which builds for aye.

We cannot understand the work of Hippocrates and the magnificence of his mind unless we try to realize the things men thought and did concerning health and disease in his time.

People were going to the temples of Æsculapius and being swindled and cheated regularly. It is interesting to know that great value was attached to the healing power of certain large yellow non-poisonous serpents which were trained to lick the wounds of patients who visited these temples. Belief in the healing power of serpents is very ancient, and explains why we usually find Æsculapius, the god of healing, depicted as holding a staff with a serpent coiled round it.

WHAT THE MEN BEFORE HIPPOCRATES KNEW

It is scarcely possible for even the most horrible superstitions to be wholly without some slight traces of truth, and there is no doubt that the priests in these temples, even before the time of Hippocrates, had come to learn a few useful facts about gymnastics and rubbing and bathing. It seems also that in certain cases iron was given as a medicine. But there is nothing worthy of mention until the arrival of Hippocrates.

It must never be said of him, as it has sometimes been said, that he freed medicine from religion. He did no such thing: he freed it from superstition. He freed it, not from truth, but from lies. Though he was a practical doctor and the father of all practical medicine after him, as well as of all medical principles, he did not believe that men and women are only bodies. Nor did he deny the Power that made the world. He had every right to be indignant against the priestly quacks who pretended to heal disease by mumbling gibberish and calling for the aid of sham gods. He said: "They thought to conceal their own ignorance and impotence under the mantle of the divine." But we shall not begin to do justice to his thought until we remember this other saying of his: "Things are not in varying degree divine or human, but God is in all things." He taught that everything in the body is divine and everything human.

In our own day the best students of medicine are well aware that drugs are much less important than used to be supposed, and it is practically true that in general the best doctor is he who uses the fewest drugs. Of course, drugs were enormously used in past time, and it is very interesting to find that Hippocrates was a reformer in this respect. He used only very simple drugs for the simplest possible purposes, much as we do when, for instance, we take a dose of castor oil. He earnestly believed in cleanliness, in bathing, in change of surroundings when people were "out of condition," as we say, and he was the first scientific student of food. He made experiments upon the digestion of food, and his extraordinary genius led him to discover and declare that when we work we burn up our bodies, and that we take food in order to make good the loss.

THE GREAT WORK THAT HIPPOCRATES DID FOR ALL MANKIND

He knew little about the internal structure of the body, though he had some vaguely correct ideas of the uses of the brain and the heart. But he discovered one great fact about the body and its functions, which was true then and is true now, both of mind and body, and which we are constantly apt to forget. He said: "All parts of the body which are designed for a definite use are kept in health and in the enjoyment of fair growth and of long youth by the fulfillment of that use and by their suitable exercise in the duty for which they were made." The time will come when even the children who read these pages will begin to be anxious about keeping their minds and bodies young. Here is the secret, as Hippocrates discovered it more than two thousand years ago.

The followers of Hippocrates were not worthy of him. They declared that he was a god. The great thinker who had opposed magic and proved it to be lies was declared after his death to perform magic cures—that is, if the patient would pay enough money to the doctor. But Hippocrates himself was not only a great thinker, not only a great doctor, but also a man of noble and honorable mind, anxious to maintain at the highest possible standard the great profession to which he belonged.

WHAT THE HIPPOCRATIC OATH REQUIRES

Those who entered this profession had to take an oath which is called the Hippocratic oath, and to which in our own day men who become doctors have to swear. Among other things, this oath makes the physician swear that he will always help the sick with all his knowledge and power, that he will supply no poison to anyone, that he will rigidly abstain from every evil employment of the means and instrument of his art, and that he will absolutely keep his patients' secrets.

His writings were a great gift to the world, although men were not then wise enough to understand all that he really had done for the cure of the human body. One of his discoveries was that the course of certain diseases may be traced by listening to the sounds in a patient's chest. It took two thousand years to make that knowledge really useful. Then

Laennec, a doctor in Brittany, invented the stethoscope, an instrument which every doctor now carries, because it enables him to hear the beating of the heart and the movements of the lungs.

The work of Hippocrates was followed up at the great school of learning at Alexandria, but men broke away from the sound science which he had taught and drifted into mysteries and folly. Not until the time of Galen was there a return to sound teaching.

Galen, another Greek, was born at Pergamus, in Asia Minor, in 130 A.D. He studied at home, and afterward at Smyrna, Corinth and Alexandria. His close study of physiology and his clear reading of the teachings of Hippocrates made him famous as a physician. He practiced for a time in Rome, where he was far ahead of all his rivals in knowledge and in skill. They hated him for this and managed to have him driven from the city. Some people say that in his later years he went back to his native place and died there in the year 200 A.D. Others maintain that he went to Sicily and lived there until the year 210 A.D.

How Galen taught the doctors of Europe for a thousand years

Galen gathered together all the safest teachings of those who had gone before him and added to these the results of his own observations. For a thousand years the teachings of Galen were all that Europe had to go upon in the science of curing disease.

It is wonderful to-day to see how much he knew, and yet how much he did not know. To those who had gone before, the nerves were mere mysterious tendons. Galen learned that the nerves are the telegraph wires of the brain and that without them there is no feeling. Other men had been mystified by the muscles, but Galen found that they hold the power by which the work of the body is performed. He knew what the muscles *did*, but he could not tell *why*. "The limbs of animals have weight," he wrote, "and, like other heavy bodies, they tend to fall to the ground. Why is it, then, that they are able to move in every direction?"

Galen was the first man to judge of health by the pulse of a patient, yet he did not understand that the pulse was affected by the action of the heart. Galen knew nothing about chemicals. All his medicines were made up of vegetable matter or animal matter. One prescription of his for a serious illness consisted of powdered snails, galls and pepper! Still, it was not his actual prescriptions, but the great laws that he made, which were so important.

How the Arabs treasured up the works of the great doctors

Unfortunately for mankind, Galen's laws were not generally observed. In the centuries during which the Roman Empire was slowly breaking up, Hippocrates and Galen were almost forgotten by Europeans, but the Jewish and Arabian physicians treasured the works of the two great men. Their writings were translated from the original Greek into Arabic, and later again into Greek and Latin. It is small wonder that in the end the works became too complicated to understand or so incorrect as to be worse than useless. Physicians in the Middle Ages were generally superstitious, and it was not until modern times that they really began to understand the laws of health.

We must not think, however, that in all these years no work was being done in surgery or medicine. Remnants of the learning of the great Greeks lingered long in Greece and Italy. We may say, in fact, that its feeble light never really died out, but was swallowed up in the brighter flame of the Renaissance.

Some famous schools of the Middle Ages

As early as the ninth century, when Alfred the Great reigned in England, we find records of a famous medical school at Salerno, in Italy. In the eleventh century the teaching at this school was in the hands of the Arabian physicians of whom we have just spoken. It is said that William the Conqueror journeyed to Salerno to be cured by them.

As the desire for learning spread, universities grew up or were founded, and most of them included schools of medicine. By the middle part of the thirteenth century the universities of Bologna, Padua, Rome, Pavia and Montpellier were famous for their medical schools. To these schools doctors flocked from other parts of Europe to study, just as in our own time men have gone from America to Europe. It is interesting to learn that women were admitted to them, and were more than once either professors themselves or assistants to the professors.

William of Salicet, a great Italian physician, wrote about wounds. His pupil, Lanfranchi of Milan, who taught at the University of Paris, and was a greater man than he, wrote about the difference between hemorrhages, or bleeding, from the veins and from the arteries. He was followed by Guy de Chauliac, a papal physician who performed many dangerous operations, and wrote a great book on surgery which has never been forgotten. This great man taught at the University of Montpellier.

After De Chauliac's time the first great names we come to are those of Paracelsus, a Swiss, who is best known as a writer on medicines, and Ambroise Paré, a French surgeon. Paré was born near Laval at the beginning of the sixteenth century. He joined the French army as a surgeon and proved himself a man of entirely original mind. In the wars he showed himself to be as merciful as he was skillful. He sought not only to heal men of their wounds, but to heal them by the tenderest means. He learned how to tie up the arteries which had been cut through, and so to stop the bleeding. He greatly improved the treatment of wounds caused by gunshots by using cold oil in dressing them, instead of the boiling oil that had hitherto been used. In many ways he improved surgical practice, and he taught Europe his methods by writing of his discoveries, so that all who wished might read.

Paré studied at Paris, which had long been noted. Padua was still famous, however, and it was to this school that Linacre, who was afterward physician to Henry VII of England, went to study. Linacre, however, is remembered, not for his learning in the science of medicine, though that is said to have been great, but because he founded a college for physicians in England. John Caius, physician to Queen Mary of England, was also a student at Padua. He is remembered as the founder of Caius College at Cambridge.

A much greater man than these two was Andreas Vesalius, who was born in the city of Brussels in the year 1514. He studied at the University of Louvain, and afterward at Montpellier, Paris, Venice and Padua. He taught and wrote much, and was brave enough to attack the writings of Galen, which had been followed so long. Later he became physician to Charles V, a position his father had held before him. After the death of Charles he was asked to become professor of anatomy at Venice, but he was drowned on his way back from the Holy Land, to which he had made a pilgrimage. He is honored by physicians as the founder of a great deal of the modern knowledge of anatomy, and especially of the structure of the human brain. Fallopius, one of his pupils, and a great man named Eustachius were his contemporaries and are well known in the history of medicine.

William Harvey, Discoverer of the Circulation of the Blood

In spite of all that these men did, however, there was still great ignorance of the working of the human body. Up to the beginning of the seventeenth century all the doctors who studied anatomy —that is, the structure of the body—were as much puzzled by the flow of blood and the heat of the body as we should be by the motion of a motor car if we knew nothing of the working of the engine which draws the car.

Something had been learned, however. In the time of Vesalius, Servetus, a Spanish physician, discovered that the veins have valves which force the blood in a certain direction. Servetus was followed by Fabricius of Acquapendente, a professor at Padua, who learned a great deal about the circulation of blood in the lungs. Then came William Harvey, who showed that it is when the heart contracts that it does its work, that it is then that it sends the blood to all parts of the body. Some men had already come near this truth, and some Italians say that Cæsalpinus, one of their noted doctors, had discovered it before Harvey. This, however, is not believed to be true. It is generally believed that Harvey made his discovery quite independently of anything that Cæsalpinus may have done. Those of us who read the story of the telephone can easily see how two men may make a discovery without either's knowing of the other's work.

William Harvey was born in Folkestone, England, in 1578, and went first to Caius College at Cambridge, where he took his bachelor's degree. Then he determined to study medicine. As the Italian schools were still far in advance of any of the English schools, he turned his steps to Padua, where he won a doc-

tor's degree. From Padua he went to Bologna, then to Pisa. Then, having gained all that Italy had to teach him, he returned to England, and taught and practiced in London, being doctor to King James I. He had great success as a doctor, until he made his magnificent discovery of the circulation of the blood, by which he is famous for all time. So far as his own time was concerned, he had the common fate of great reformers and thinkers, and, as was shortly afterward said, when his book was published "he fell mightily in his practice; 'twas believed by the vulgar that he was crackbrained, and all the physicians were against his opinion, and envied him." Such was the reward of this man for one of the greatest discoveries of the human mind.

HARVEY'S WONDERFUL MIND SEES THE GREATEST FACT OF LIFE

It is very easy for us to accept nowadays what Harvey was the first man to show. But let us remember for how many centuries the world needed a Harvey, and waited for him. Energetic and thoughtful and eager men there were during all those long ages, but they had not the great qualities of mind which were Harvey's.

Everyone around him, and everyone in the past for thousands of years, had believed that the breath of life was formed in the heart from the breath which we take into our lungs. We use many expressions at this very day which depend upon this ancient theory of what the heart was for. When boys in the street ask themselves the question, "Are we downhearted?" they are talking, if they knew it, in the old language of Galen and of many who went before and after him, who thought that when the heart was not making plenty of vital spirits, it collapsed, and that when a man is, as we say, high-hearted, it is because his heart is being swelled with the abundance of "good spirits" that it is making.

In the same way, we speak of a person's being in "high spirits" and in "low spirits." No ordinary man could have disproved these views and demonstrated the real truth of the matter. But Harvey was no ordinary man.

Often we see the expressions "destructive criticism" and "constructive criticism." Destructive criticism is when men show that others are wrong in their views, which is a comparatively easy thing to do; constructive criticism is much rarer and much more difficult, for it means finding out what the real truth is. Harvey was a great master of both kinds of criticism. First he showed that the old theory of the heart was utterly wrong; then he set himself the tremendous task of finding out what the heart really does. In his own words, he proceeded "to contemplate the motion of the heart and arteries, not only in man but in all animals that have hearts." He tells us he found the task so difficult and laborious that he was almost tempted to think that God alone could understand the motion of the heart; but he would not be stopped. He studied animals, large and small. He used a magnifying glass and saw the heart beating even in wasps and flies. He studied a developing egg—that is, a developing chicken—and saw the tiny heart beating in the beginnings of the chicken, as they are seen in the egg when the hen has been sitting on it for about five days.

In this manner Harvey found that the heart drives the blood, and his next great task was to find out where and how it drives the blood. He discovered for a certainty that the quantity of blood driven by the heart as it beats was so enormous that it could be accounted for only by supposing that the same blood passed through the heart again and again. He says:

> I frequently and seriously bethought me, and long revolved in my mind, what might be the quantity of blood which was transmitted, in how short a time, and so forth, and . . . finally, I began to think whether there might not be a motion, as it were, in a circle.

This is how he concludes his great argument:

> It is absolutely necessary to conclude that the blood in the animal body is impelled in a circle, and is in a state of ceaseless motion; that this is the act or function which the heart performs by means of its pulse, and it is the sole and only end of the motion and contraction of the heart.

Harvey never saw the tiny vessels by which the blood passes from the arteries to the veins on its way back to the heart. Four years after his death these vessels were seen in the lung of a frog through the microscope. Nowadays thousands of people have seen magnified living pictures, showing the tiny blood-cells rushing through the little tubes in the tail of a

tadpole. But the discoverer of the circulation of the blood could see these tubes only by the eye of faith. He died still doubtful and unsatisfied as to how arteries and veins could communicate with each other.

Harvey was a keen student also of the way in which living things grow from their beginnings, and, with the approval and help of Charles I, he studied largely in the parks at Windsor and Hampton Court. The last book he published was a great work on this subject—far the greatest book on the subject ever written—and in it he laid down the great truth that all the various kinds of animals develop from eggs. We cannot really judge the greatness of Harvey unless we read his works and see, not only how he studied nature and how profoundly he thought, but how bravely he could bear the loss of many of his manuscripts, which were stolen by a mob, and with what dignity he could refrain from speaking hardly of those who attacked him. He felt: "To return evil speaking with evil speaking I hold to be unworthy in a philosopher and searcher after truth."

With Hippocrates, Galen and Harvey we trace the history of our knowledge of the body from its beginning to the great central fact of its working, which is the circulation of the blood. After Harvey everything is different. The modern age of thought about health and disease begins.

William Harvey explains to Charles Stuart how the blood circulates through the body.

Physicians of the Seventeenth and Eighteenth Centuries

The change began to come about in the seventeenth and eighteenth centuries.

Much was done in Holland for medicine by Hermann Boerhaave, who was

born near Leyden in 1668. He was not only a physician, but also a chemist and botanist, and was therefore able to teach the real nature of some of the medicines used. He not only taught his students from books, but he made them study diseases at the bedsides of patients. This he insisted upon, so that before they began to practice as doctors they might themselves know from experience the nature of the illness they undertook to treat.

In England the change was due largely to the work of two brothers, William and John Hunter, who were born in a little town in Lanarkshire, Scotland. William Hunter spent five years at the University of Glasgow and afterward went to London, where he became a surgeon. John Hunter studied with his brother William and also in the great London hospitals. He was an army surgeon for a time, but later settled down in London and devoted himself to the practice and teaching of his profession and to the study of anatomy. He paid special attention to comparative anatomy—the structure of the bodies of various animals as compared with one another and with man. This study is very important, and through it many of the great discoveries have been made.

Edward Jenner, who discovered vaccination

One of John Hunter's pupils who became famous was Edward Jenner, the discoverer of vaccination. He was born at Berkeley, in Gloucestershire, England, in 1749. After his training under Hunter he settled down in Berkeley, and there for years he studied the subject of vaccination for smallpox.

He believed and hoped that by spreading vaccination throughout the world smallpox would be entirely stamped out of existence. At first his theory was hotly opposed, and there is still opposition. But after a year, more than seventy of the leading medical men of London signed an article declaring their faith in it. News of the discovery was carried throughout the civilized world. Jenner received very many honors and Parliament gave him $150,000. He died in his native village at the age of seventy-three.

Though there is opposition to vaccination by people who do not think it wise to introduce sick matter into a well body, the defenders of the practice point to the fact that in former days there were epidemics of smallpox which swept away thousands and made the people go wild with terror. Now no one fears smallpox very much, and deaths are less frequent. Jenner also taught the difference between typhus and typhoid. Curiously enough, people who are now likely to be in danger of infection from these latter diseases are vaccinated also.

Philippe Pinel, who began to care for illness of the mind

Although efforts were made from the very dawn of civilization to cure illness of the body, little was done until the last century to cure illness of the mind. The Greeks had a glimmering of the true way of caring for sick minds, but the doctors of the Middle Ages had none. If people who were afflicted with illness of the mind could not be cared for at home, they wandered about the country or were thrown into prison and cruelly treated. Some few were cared for in monasteries and convents, especially at Gheel, in Belgium; but the numbers who could be taken in were few, and very little could be done for them. The general opinion was that they were very wicked people and ought to be punished.

This was the state of affairs when, late in the eighteenth century, Dr. Philippe Pinel was appointed physician to the Salpêtrière, an institution in Paris where a large number of these afflicted people were confined. The first thing that he did was to order the chains with which many of his poor patients were loaded to be struck off, and with that act of kindness the proper treatment of mental illness was begun.

Pinel, who was born in the little town of St. André, not far from Paris, had studied at the universities of Toulouse and Montpellier and had already written a book setting forth his views. He continued to study and teach throughout his life, which ended less than a hundred years ago. His teaching inspired others to follow in his footsteps, and since his time much has been learned about mental illness. It took some time to overcome old ideas, but every care is now taken of patients who suffer from disease of the brain. Doctors give their whole life to the study of mental diseases. Sometimes it is found that an illness can be cured, or that its cause may be removed by an operation or by some special treatment.

THE LONG SEARCH FOR SOMETHING THAT WOULD BRING SLEEP

After such advances in surgery had been made that important operations could be performed, surgeons began to look for some drug that would enable them to put their patients into a deep, quiet sleep during which they would feel no pain. This is what doctors call "producing anæsthesia." The word *anæsthesia* comes from two Greek words which mean "not feeling." It was Oliver Wendell Holmes who suggested the new word to Dr. W. T. G. Morton. It is only when anæsthesia is produced that a patient can stay quiet enough to let a surgeon do the wonderful things to which in our day we have become accustomed.

In the early nineteenth century men had performed serious operations while the patients were conscious of pain, but only when the doctor saw that without an operation the patient would quickly die. You can see, therefore, how important an "anæsthetic" is, and that is why for a long time the thoughts of men of science had been turned toward finding this blessing to mankind.

The writings of the Greeks seem to show that they knew of some drug which made people unconscious of pain, and it is said that a famous Italian surgeon of the thirteenth century used a preparation of mandrake for this purpose. Even if this is true, the knowledge has been lost. It was not until the nineteenth century that men succeeded in their search for some substance that would for a time lull the sense of pain to sleep.

Sir Humphry Davy, who in his youth began to study surgery, discovered that nitrous oxid would produce anæsthesia, and this gas is still sometimes used by dentists when they have to extract a tooth. A little later Michael Faraday said that sulphuric ether could be used as an anæsthetic. The knowledge thus gained was first used in the United States.

THE MEN WHO DISCOVERED ANÆSTHETICS

Just twenty years after Faraday's discovery Dr. Crawford W. Long, of Jefferson, Georgia, used this gas to enable him to perform a very difficult operation which would have been impossible without it. The importance of what Dr. Long had done did not, however, become widely known, and it is only in this century that he has received honor for his work. He was one of the quiet great men who do much good in their own community, but, perhaps because of their humility, lose sight of the importance of their deeds. Meantime the search went on, and in 1844, two years after Dr. Long's use of ether, a dentist named Horace Wells, of Hartford, used nitrous oxid when drawing teeth, but soon dropped its use.

About the same time Dr. W. T. G. Morton, of Boston, was working in the same direction, and it is to Dr. Morton that the chief honor of discovering anæsthetics is due. He was a New England boy, born on a farm near Charlton, Massachusetts. He played and worked on the farm. He went to a country school and later to an academy. When he was twenty-one he went to the Baltimore College of Dental Surgery. Two years later he graduated, and went to Boston, where for a time he was in partnership with Dr. Wells, who afterward left him and went to Hartford.

He soon saw that he needed greater knowledge of the human body than he possessed and began to study anatomy. At the same time he continued to experiment with one substance after another in the effort to find a good anæsthetic. At length Dr. Charles T. Jackson, a physician who was also a chemist, suggested that he try sulphuric ether. He acted on the suggestion and was so successful in his experiments that surgeons in Boston began to use it in the Massachusetts General Hospital in 1846. Other men tried to take the credit of the discovery away from Dr. Morton, but he proved that it was his own, and after his death a monument was erected to his memory in Boston.

DR. JAMES SIMPSON DISCOVERS USE OF CHLOROFORM

The fame of the discovery soon spread to Europe, and ether was used in London a little over a month after its first use in Boston. Among the surgeons who quickly saw its great value was Dr. James Simpson, one of the professors at Edinburgh University. But the methods used in giving ether were not then nearly so good as they are now, and Dr. Simpson began to look around for something the use of which would be safer than ether.

He began to experiment and, with two of his friends, tried many things. He worked for months without success, but at last remembered a little bottle of

chloroform which a Scotch chemist had sent him. All the other things that he had received from many chemists had proved unsatisfactory, but the chloroform did the work he needed. He inhaled its odor and immediately fell into a deep, heavy sleep. He had made a most valuable discovery, though it might have been at the cost of his life.

Physicians to-day know the exact strength of the anæsthetics they use, and measuring instruments have been devised so that they can tell the exact amount that it is safe to give. But all this is the result of hard work and deep thought. The men who first of all experimented on themselves for the good of others deserve high honor for their bravery. Chloroform, in particular, was a little-known substance. It had been discovered only in 1831 by two French chemists, and analyzed and described in 1835 by Dumas, another noted French scientist.

SCOTTISH LAD STUDIES MEDICINE AT VERY EARLY AGE

Dr. Simpson was born in 1811 in the little town of Bathgate, Scotland, where his father was a baker. At the age of fourteen he went to Edinburgh University. At nineteen he had taken his degree in surgery, and at the age of twenty-one was ready for his degree as doctor of medicine.

When he found this new use for chloroform, he was already well known for his surgical skill as well as for his teaching. He at once began to use chloroform in his practice, and his success was so great that its use spread quickly. Surgeons and students flocked to see him perform operations, and among them was Dumas, who came to see this most important use to which chloroform had been put.

On one occasion Queen Victoria was advised by her doctor to take chloroform to dull the pain she was suffering. She did so, and the experiment was a great success.

Simpson's method of putting a patient under chloroform was very simple. He sprinkled the drug upon a towel and held the towel over his patient's face. This became known as the "open method" when another device called the "Gwathmey inhaler" was brought into use. The Gwathmey inhaler is used for ether or chloroform. It mixes the drug and the air in the quantities of each that the doctor wishes.

A great advance in the giving of anæsthetics was made with the discovery that the patient's diet had much to do with the success or failure of the drug. No food of any kind, liquid or solid, was permitted for several hours before an anæsthetic was given, and the whole of the digestive system was empty and at rest. This put an end to what was called "ether pneumonia" and other ailments which were thought to have been caused by the anæsthetic itself. The unpleasant sickness which usually followed the recovery of consciousness by a patient was better understood and controlled.

Meanwhile doctors in America continued to experiment with ether, and success followed. There were now two drugs which would destroy pain. Both are used to-day, though in the United States doctors generally prefer ether when it can be had, while chloroform is preferred in England. In Canada some doctors use one and some the other.

Men have discovered other drugs which produce what is called "local anæsthesia." This means that the nerves are prevented from conveying the sensation of pain to the brain, which itself is clear. Some of them, if sprayed upon the skin, freeze the flesh. Others simply paralyze the nerves, as cocaine and eucaine. Others are injected between the vertebræ and prevent sensation from passing along the nerves.

Probably the most deadly pain known to mankind is claimed to be brought on by an attack of angina pectoris. Dr. Simpson, the discoverer of chloroform, suffered torture from this disease before he died of it, yet his own discovery could not aid him. It was Sir Lauder Brunton who found that the fumes of a drug called amyl nitrate relieved this great suffering.

The introduction of drugs enabling science to control pain was of enormous importance. It was now possible for the most delicate operations to be carried out without causing the patients any pain, and cases which before had been hopeless became comparatively simple. That was certainly one of the greatest advances in the history of medical science. Anæsthetics made possible so many wonderful discoveries. These we shall read about on page 5481, where we tell of the doctors and scientists who have made great names in the past eighty years.

THE NEXT STORY OF MEN AND WOMEN IS ON PAGE 2843.

Dickens in his study.

Thackeray in his study.

THE BOOKS OF DICKENS AND THACKERAY

CONTINUED FROM 2632

CHARLES DICKENS was born at Portsmouth in 1812. His mother was the daughter of a naval lieutenant, and his father, John Dickens, was a clerk in the Navy Pay Office—the original of the kind-hearted, irresponsible Mr. Micawber, who was always hoping that "something would turn up" to get him out of his difficulties. There were eight children; Charles, the eldest boy, was small and delicate.

The happiest memories of his childhood belonged to the time between his fourth and ninth years, when his father was stationed at Chatham. The child loved the coming and going of the redcoats, loved the Kentish countryside, and Rochester Cathedral, and the castle, and James Lamert, the young relation from Sandhurst who took him to the theatre. He loved, too, a house called Gadshill Place, which stood on some high ground outside Rochester, for his father had once said that if the boy worked hard he might one day live in it; and this was his secret dream for some years.

Charles went to a small day school while he was at Chatham, but it was his mother who first taught him to read English and Latin. One day in a little room upstairs he found a pile of books; it was a cheap edition of famous novelists, and thus the child entered a world even more delightful than Kent. He traveled with Robinson Crusoe, he took arms with Don Quixote, he posted through the eighteenth century with Fielding, he wept with the Vicar of Wakefield. A thirst for knowledge, a desire to be "a learned and distinguished man" stirred in him. He began to write stories himself, to the admiration of his childish friends.

TERRIBLE DAYS FOR CHARLES WHEN HIS FATHER WENT TO PRISON

But all his happiness came to an end when his father was called to duty at Somerset House. Their new home was a wretched little place in a poor part of London and their back-garden looked on a squalid court. The child began to understand that his father was heavily in debt, and did not know which way to turn for money.

There was no schooling for Charles now. He cleaned boots, helped in the house, and looked after the little ones. Things grew steadily worse. At last John Dickens was taken to the Marshalsea, the debtors' prison. When this happened, Charles thought his heart would break.

He was next employed in carrying the household belongings, piece by piece, to the pawnbroker. First of all went his friends the novelists. Soon no home was left, and the mother took her

younger children to join their father in prison.

The Marshalsea was a queer place; a prisoner could receive visitors, and make himself a tolerably comfortable home there. The Dickens family still had a small income, and now had no rent to pay; they kept a servant and wanted for little, except the father's freedom

THE EARLY DAYS CHARLES DICKENS SPENT IN A BLACKING FACTORY

Meanwhile James Lamert had persuaded his brother-in-law to buy a blacking warehouse, and make him manager. It was thought an excellent idea that Charles should "make himself useful" there for six or seven shillings a week, and that his relation should give him lessons in the dinner hour. But this custom soon died out, and Charles went from the counting-house to a workroom downstairs. There the boy who had dreamed of becoming a learned man was set to labeling pots of blacking.

He worked in the window, where people used to stop and stare. He worked with rough boys who cared for none of the things he loved. He went home to cheerless lodgings. He was utterly cut off—this little child—from love or advice, from friend or book. He provided for his own food; and, lest hunger should tempt him, he used to tie up each shilling separately when he got his wages, and label it with the name of the day it must provide for. He spent Sunday in the prison.

Later on he got his breakfast and supper in that bitter bad prison, and so was much better fed. One evening at this time a boy from the warehouse insisted on seeing Charles home, because he had been taken ill over his work. The poor child could not bear to own that his "home" was prison. After many efforts to shake him off, Charles shook hands in front of a house, mounted the steps, and rang the bell. His friend went away, and when the door was opened, Charles coolly asked the parlormaid if Mr. Robert Fagin lived there!

THE STORY OF DAVID COPPERFIELD DRAWN FROM REAL LIFE

So deep was the misery of this time that more than twenty years after Dickens could not bear to speak of it. But at length he found a relief from its haunting memory in writing it down, and the story is told in David Copperfield. It left a mark on his character forever. Though he was called the cheerfulest man of his age, at very rare moments his friends saw in him an almost fierce self-reliance and a sensitiveness which he said came from "the never-to-be-forgotten misery of that old time."

The little boy had no hope. He thought he would never be educated or free. There seemed to be nothing before him but this odious work, this loneliness, this squalor, this shame.

By and by John Dickens was left some money which paid his debts and released him from prison. But Charles remained at his work till the manager quarreled with his father, who withdrew his son in a huff, and sent the thankful boy to school. The head was a brutal creature, but Dickens was one of the day boys, and they escaped ill-use. His companions remembered the twelve-year-old Dickens as handsome and curly-headed, wearing a short jacket and long trousers of "pepper-and-salt," with a collar instead of the frills then usually worn. He invented a secret language, wrote stories, got up plays and was concerned in every prank in the school.

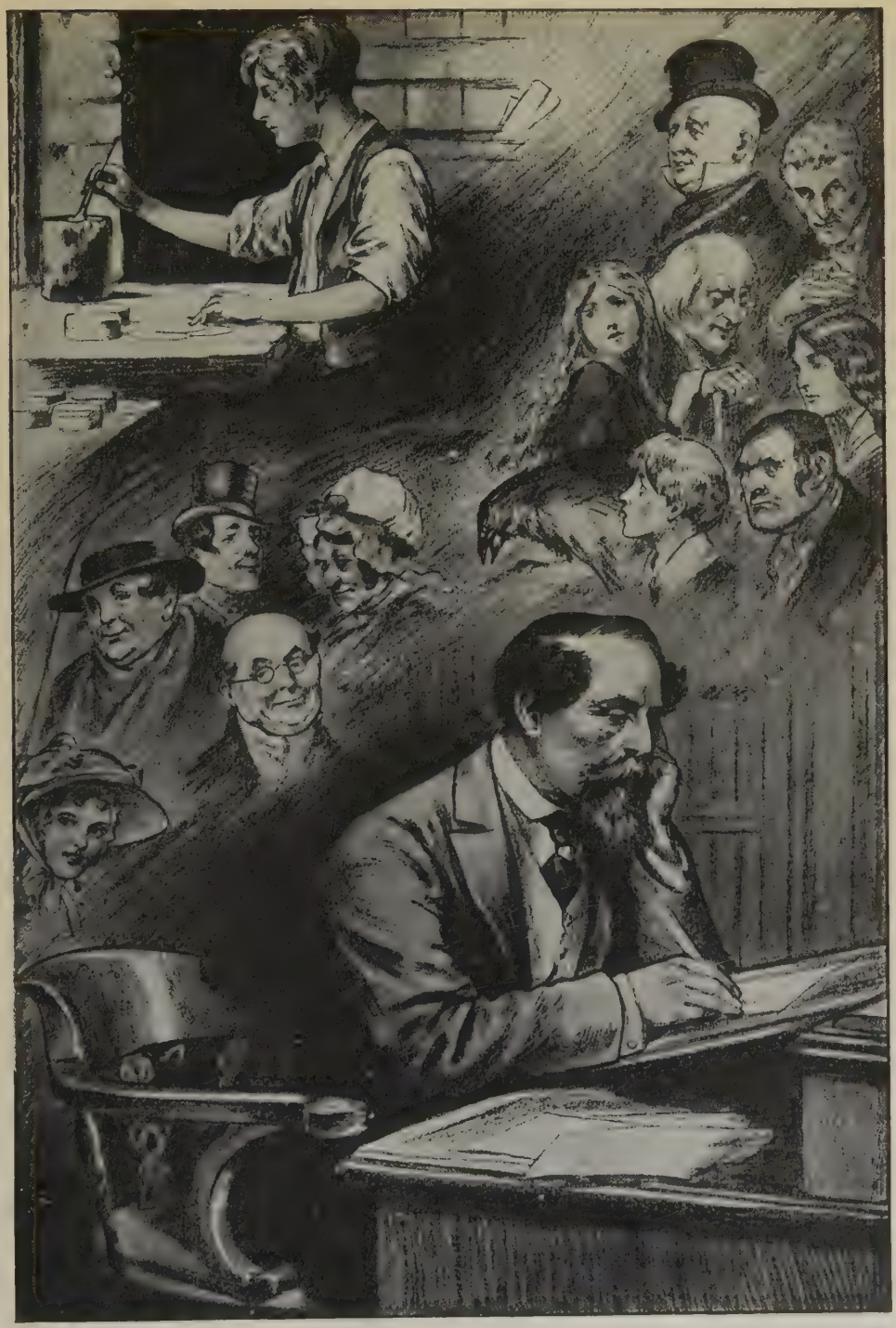
At fifteen he became a sort of office boy to a solicitor, but he was teaching himself shorthand, and did not stay there more than eighteen months. His first reporting work was in one of the offices of Doctors' Commons; after two years of this drudgery he was promoted to the Gallery of the House of Commons, and later was sent all over the country to take down speeches.

THE GREATEST STORY-TELLER ENGLAND EVER HAD OF THE LIFE OF THE POOR

In 1833 the young reporter became a contributor as well. When he was twenty-four, some of his articles were printed in book form. The Sketches by Boz were well received, and were soon followed by Pickwick—and fame.

We have dwelt long on his childhood because he himself seemed to think it the most significant part of his life. What remains to be told is a story of work. He poured out a series of novels filled with characters and incidents. He edited magazines. He addressed philanthropic meetings. He held huge public readings, and it was from overstrain that he died of a stroke, very suddenly, in 1870. He married, and became a tender father; he traveled; he made many friends—friends like Carlyle and Thackeray. But his real

DICKENS AND SOME OF HIS CHARACTERS



We here see Charles Dickens as a boy, pasting labels on blacking pots, and later as the famous novelist he became. In the background we have a glimpse of some of the characters he created in his books.

life was in his books. He hated to say good-bye to his characters when he came to the end, and felt he was sending a part of himself "into the Shadowy World." The aim of these books was to strike "a great blow for the poor."

He was one of the greatest comic writers, but behind all his laughter was the memory of that never-to-be-forgotten childhood in the poor parts of London.

THE POOR BOY WHO MADE LONDON A BETTER PLACE FOR POOR CHILDREN

The boy who had cried as he lay in bed praying "to be lifted out of the humiliation and neglect" of his life, now lies buried in Westminster Abbey.

But strangest and best of all his triumphs was this, that the poor child who wandered ill-fed and ill-clad about the streets of London made it a better place for all the poor children who came after him.

The book that first won him popularity was Pickwick Papers. He began to write it as the letterpress to comic illustrations, published in monthly parts. Like his first book, it was a series of sketches. It had no plot; Dickens himself had no idea where the story would wander. It grew from month to month as his fancy led him on. But the characters in it captured the interest of his readers, and they became a topic of conversation for the whole of the English-speaking world. It was Mr. Pickwick's servant, Sam Weller, who first convulsed the nation with healthy laughter, and the book has never lost its hold on the reading public.

It remains a book that may be taken up at any time and read at any chapter with a certainty of having a cheering effect. But it is far more than a cause of empty laughter. It gives as well a picture of English life and character in the early nineteenth century that, under its oddity and exaggeration, is true and kindly.

And here it may be said at once that nearly all the novels which followed from the pen of Charles Dickens live only as a series of sketches. They are pictures of life somewhat loosely strung together. After writing The Pickwick Papers he began to weave his stories round a plot. In his later books the plot became more and more involved, especially when the author became friendly with Wilkie Collins, the most elaborate of plot-makers. Collins' books were a maze through which the reader searched for the explanation of a mystery, and Dickens followed the fashion. But his plots are in no way an essential part of his books. We forget them, and do not miss them. What we do remember is the host of characters he created, and the situations in which he placed them. Dickens lives in the men and women he made us know and the simply dramatic scenes where they display themselves before us.

Late in his life he gave readings from his stories with great effect. These can be cut up into separate scenes, and presented as pictures of life and character, with only the slightest reference to the thin thread of story that winds its way through each book.

THE MAN WHO TAUGHT HIS FELLOWS THE LESSON OF HUMAN UNDERSTANDING

The modern novelist is very much more expert than Dickens was in shaping a compact and rapid story—a yarn which we read with breathless haste and as quickly forget. But Dickens walks with us through the highways and byways of the world and shows us vast numbers of interesting people. Indeed, we might see them any day for ourselves if we could but look on mankind with his tolerant, humorous eyes and his delight in human character, particularly its queer varieties. He unrolls before our gaze a great panorama of the everyday life of everyday people, and shows us something in each which is more than commonplace.

Shakespeare did the same, besides showing us great natures stirred by deep emotions. Scott did the same. They, like Dickens, might truthfully make the demand of Abou Ben Adhem, in Leigh Hunt's fine sonnet, "Write me as one that loves his fellow-men." It is that way of accepting mankind with a large-hearted toleration and love, even when it is not wholly admirable, that has endeared him to the hearts of generation after generation of readers. It has placed him among the world's great writers, never to be forgotten or neglected. He teaches mankind the age-long lovely lesson of the understanding heart.

When Dickens had found, in writing The Pickwick Papers, his true vocation, he put aside once for all the providing of amusement only as an aim sufficient for a writer. In Oliver Twist he wrote the first of several stories in which he became a crusader against public abuses.

THE POWER OF THE PEN THAT IS MIGHTIER THAN THE SWORD

No one will deny that fiction may be used powerfully in destroying institutions that no longer serve a good purpose, and Dickens used it in the spirit of an ardent reformer. But a tale that has a reforming purpose generally loses some of its charm as a tale. That, however, did not prevent Dickens from attacking evils of which he had personal knowledge.

In Oliver Twist it was the poor-law system as it affected children that he attacked. In Nicholas Nickleby, his third story, it was the meanness and third-rateness of the inferior types of boarding-schools. Later, in Bleak House, it was the law's delay in clearing up its business. In Little Dorrit it was the official "red tape" in what he called the Circumlocution Office, and the wickedness of the debtors' prison. Of this he had had so much experience through his own father's imprisonments.

Such evils as these pass away, and denunciations of them in fiction only serve at last as a record of vanished wrongs. Dickens, by his treatment of them in his books, reveals the kindness of his heart and the purity and public spirit of his motives. This does not add to the attractiveness of his stories.

THE CRUSADING PART OF A REFORMER PLAYED BY DICKENS IN HIS TALES

What he wrote to rouse his generation increasingly saddens the more merciful mind of to-day. Still, it is well we should know of wrongs that have been, so that we may safeguard the world against their return. No other novelist has played, through his tales, the part of a social reformer so persistently as Dickens played it.

The humanity that we see in these crusading attacks on wrong shines as clearly, and perhaps as effectively, in the general spirit of all his stories. He needs no pulpit for his teaching. It stands out from every page, whatever his immediate subject may be. In his other stories, particularly Martin Chuzzlewit, with its fine characters of Tom Pinch and Mark Tapley, Great Expectations, the best of his later tales, and his masterpiece, David Copperfield (written midway through his busy life, when also the lovely series of Christmas tales was written), Dickens put the best of himself. This is more even than the efforts he was making toward some earnestly desired reform.

THE TALE THAT TELLS THE STORY OF ITS AUTHOR'S EARLY LIFE

There can be no question as to the place of David Copperfield in his list of books. It was his own favorite work, and well it might be, for with but slight disguise it pictured his own early life. Nowhere else is there quite such a fascinating collection of characters as the Peggotty family, the Micawbers, Betsey Trotwood, Tommy Traddles and David himself. It has been said that Dickens was never successful with his heroes and seldom with his heroines, and we must admit that he had a knack of making them weakly human. But we must put in a firm plea for David as a hero, and for Edith Summerson in Bleak House as a real heroine. Nor can Oliver Twist, or Pip in Great Expectations, or Agnes in David Copperfield be lightly dismissed.

Still, most of the men and women whom he created, and who are to us as real as the people whom we know personally, are just characters that cross the stage now and again, and not those whom the tales are planned to display. And, after all, the besetting weaknesses of chief personages in the stories give to them an air of reality that would be weakened if they were more perfect.

THE SECRET OF THE POWER OF DICKENS OVER THE HUMAN HEART

Why should Dickens be expected to draw perfect heroes? He was himself intensely human. He belonged to his age and had its weaknesses. One of them was its inclination to excessive sentiment. It enjoyed sorrow in an exaggerated kind of way, and so did this most cheery of men. So he could picture little Nell and Paul Dombey with an excess of pathos that made him and his readers weep together, but appears to a later generation sadly wanting in restraint.

We must take him as he was, and understand that his eager nature flung itself headlong into whatever absorbed it. It sometimes reached excess in grief and scorn and somewhat boisterous humor, in occasional too fine writing, exaggeration and caricature. Dickens, beyond all other novelists, "let himself go," and that is one of the secrets of his power over the human heart.

He could be restrained and almost classical in style, as he showed when he experimented in history, in Barnaby Rudge and A Tale of Two Cities. But

the real Dickens is the man who was at home in the crowd, especially the London crowd. He knew them in all their wayward, lovable, comical variety. He saw with deep delight that in everyday people which is not commonplace, and he could picture it as no one else ever has done. And they, the men in the street, will keep his memory green.

THE WORLD-WIDE MONUMENT TO A MAN WHO LIES IN A SIMPLE GRAVE

To them he committed it. He was content that his books should be his only monument. He forbade all inscriptions on his grave except his plain name, and there it is, centrally, in the Poet's Corner of venerable Westminster Abbey, "Charles Dickens." The hearts of his readers will be stirred for many a generation as they read it, as they are stirred by the name of no other man that ever won fame by an understanding study of his kind.

DICKENS' TWO VISITS TO THIS COUNTRY

Dickens paid two visits to this country. On the first occasion, in 1842, he came as a young man of thirty, but as a young man already arrived at fame. (Sometime, perhaps, when we are enjoying the comforts of travel aboard a modern liner we may enjoy the amusing account of transatlantic travel as it was in those days.) It is supposed that the author came to look up an unwise investment he had made. A dishonest American promoter in England had sold worthless land lots in Cairo, Illinois, pretending that Cairo was a flourishing city instead of a struggling settlement in mud flats. Charles Dickens had invested a large share of his slender means in the scheme. When rumors of its worthlessness reached England, he planned to see Cairo for himself. He was writing The Pickwick Papers at the time, and he makes Tony Weller say to Sam, "Have a passage taken ready for 'Merrika . . . and then let him come back and write a book about the 'Merrikans as'll pay his expenses and more, if he blows 'em up enough." Perhaps Dickens forgot Tony's advice in some respects, but he certainly came to America and wrote two books which, in the opinion of many Americans, did "blow 'em up enough."

The first of these books, My American Notes, was written shortly after the first visit. Cairo had been visited and been disapproved of. "At the junction of the two rivers, in ground so flat and low and marshy that at certain seasons of the year it is inundated to the house tops, lies a breeding place of fever, ague and death, vaunted in England as a mine of Golden Hope, and speculated in, in the faith of monstrous representations to many people's ruin. A dismal swamp, on which the half-built houses rot away, cleared here and there for the space of a few yards, and then teeming with unwholesome vegetation, on whose baneful shade the wretched wanderers who are tempted hither, droop and die and lay their bones; . . . such is the dismal Cairo." Readers of his second book, Martin Chuzzlewit, recognize from whence Dickens drew his picture of Eden, the place to which in the story Martin and the faithful Mark Tapley were similarly decoyed.

Besides Cairo, Dickens found fault with other things in his books, particularly with the press of the day. It *was* bad, but the visiting English author thought that because a section of it was noisy and ignorant and scandalous (that part of it which we to-day call the yellow press) all of it must be. He did not discriminate.

The institution of slavery shocked and angered him—but he had never been accustomed to it, had not lived in a climate where colored labor was necessary, and, moreover, made it his life's work to attack whatever he considered a public wrong. When we feel annoyed at his vehemence to-day, we must remember that he used the same weapons of ridicule and satire against English things that he disapproved of.

THE CORDIAL RECEPTION GIVEN TO THE WRITER

He was given a very fine and cordial reception in Boston and in New York, and some of the best American writers and thinkers offered him generous hospitality. It is for this reason that Dickens has been accused of ingratitude and churlishness in painting so clearly what he thought were the faults of our country. Yet no public man who makes it his mission to correct public abuses has ever consented to be gagged. Though John the Baptist cried out the faults of his generation "in the wilderness" which was No-Man's-Land, yet all the same he was scolding many who had come a long and tiresome journey to see and hear him, and many who were his admirers.

A quarter of a century later Dickens

came again—and this time for a different purpose. He planned to give readings from his books in the largest cities of the East. Some resentment had been felt at first because of American Readings and Martin Chuzzlewit, but the reading tour proved a great success. In an age where people had fewer distractions and took their pleasures more quietly, enthusiasm for this form of entertainment ran high. Often the queues of ticket purchasers were a mile or half-mile long. He read in Boston, New York and Philadelphia, in Washington and Baltimore and the chief New England cities, as well as in the large centres of northwestern New York State. Sometimes the Christmas Carol, sometimes the favorite Trial from Pickwick, or Copperfield were given. As a rule there were two items on the program with a short interval between. A sad reading would be followed by a gay, so as to make use of the force of contrast. Originally eighty readings had been planned; seventy-six were actually given.

ANOTHER GREAT NOVELIST OF THE DAY, WILLIAM MAKEPEACE THACKERAY

William Makepeace Thackeray, the novelist who, because he lived at the same time as Dickens, was regarded by the unobservant as his rival, was almost as unlike him in style and outlook as a contemporary writer could be.

Thackeray, in his striking features, was an aristocrat. He saw the common world from above, and not from its midst. The world he lived in naturally was that which surrounds the society of the rich.

It was not that Thackeray was himself a snob; far from it. No one saw the weaknesses and humors of snobbery more clearly than he saw them; and he was a very human man with a big heart, like Dickens. But the world of society was the world he knew and naturally belonged to. Though he and Dickens lived and wrote side by side in time and were under the same influences, they do not naturally come together for comparison, but rather by way of contrast.

Thackeray was born in Calcutta on July 18, 1811, the son of a civil servant, and he was sent home as a child to be brought up in the English climate and educated in the most approved way. He had no youthful experiences to compare with those of Dickens, but was educated at Charterhouse and Cambridge, and he went forth into the world with, perhaps, rather more money in his purse than was wise or good for him.

At first he thought of the law as a profession, then of art, and at last, after dabbling casually in journalism, he was obliged to take to writing in earnest for a living, as he had lost most of his money. A good deal of Thackeray's time in his early years, after school and college, was spent in Paris, where he went when the art fever was on him. There is no doubt he would have been very happy as a black-and-white artist if he could have acquired the something more needed for success. He had humor and could indicate character in his drawings, but he never had, and never would have had, the necessary mastery of drawing. As an illustrator he was a distinct amateur.

WHY WE SHOULD BE PLEASED THAT THACKERAY WAS A BAD ARTIST

But on the lighter side of journalism he succeeded, and the great comic paper, Punch, gave him scope for his gifts in this line. Thackeray, too, could write pleasing verse. In short, for ten years he was a journalist with a most useful adaptability, and a special expert in making mock of the vanities and shows of the society he knew and half despised. Then he began to express himself in the form of fiction, and found his true vocation as a writer.

The novels on which his fame is founded are Vanity Fair, Pendennis, Esmond and The Newcomes. They are all in the same social vein, but have a considerable range of time and variety of setting. Vanity Fair takes us back to the days of Waterloo, Esmond is semi-historical, Pendennis and The Newcomes were modern in Thackeray's day, and followed the Dickens model in having unheroic heroes.

There is no English novelist of real distinction who divides sincere opinion more deeply than Thackeray. He did not, during his life, have a breadth of popularity comparing with that won by Dickens, yet Thackeray had, and has, ardent admirers who would place him almost in a first place as a novelist.

THACKERAY AND HIS FINE USE OF THE ENGLISH LANGUAGE

That, however, is not the general verdict of most thoughtful, tolerant and candid readers. Many of us find him rather heavy to read, in spite of a style that is singularly pure and free, often rising into beauty without being forced. It would be difficult to find a writer in the whole

range of English literature who illustrates the ease, strength and clearness of the language better than Thackeray when he is writing seriously, with his heart and mind in full play. His fine use of English is an accomplishment which, more than any other, has won for him admiration. But his stories, though they abound with clever strokes, do not read as naturally as the stories of Scott and Dickens.

But that Thackeray's novels are worth reading is generally acknowledged. Vanity Fair is a leisurely satire, except where Becky Sharp is concerned, suggestive, like all novels of those days, of time and taste for reading. Esmond, in the judgment of many good critics, is a brilliant historical study under the dress of fiction, while Thackeray put some of his best work into the characters of Pendennis and Colonel Newcome in The Newcomes.

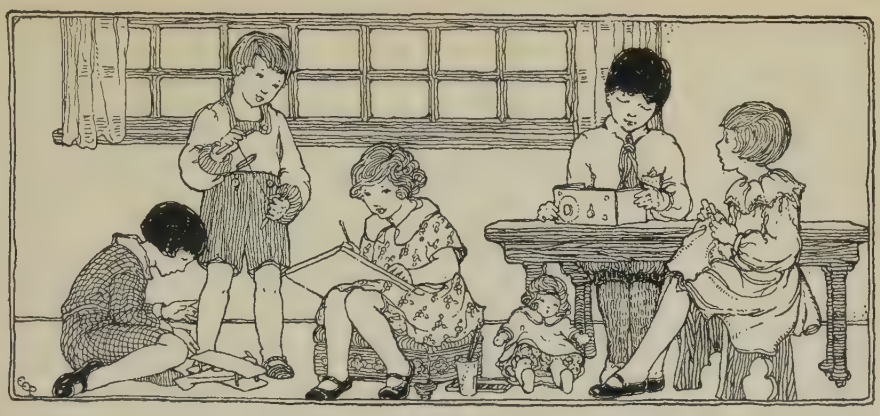
THE PROUD POSITION THAT THACKERAY HELD AT THE END OF HIS LIFE

Thackeray, like Dickens, gave public lectures, reading his own brilliant historical essays; and, also like Dickens, he was a successful magazine editor. For one who was largely a satirist, he was a man of a tender and sensitive nature, and he left strict orders that his life should not be written. This great writer and very lovable man died suddenly on the morning of Christmas Eve, 1863, and was buried at Kensal Green. A memorial bust was soon afterward erected to him in Westminster Abbey.

Nearly all of Thackeray's books are vivid pictures of London and country life in seventeenth- and eighteenth-century England. In one, however, The Virginians, the scene is laid partly on our own continent. Esmond and The Virginians are closely related, as in the former the hero, Colonel Esmond, retires to estates in Virginia to live, and in the latter it is his twin grandsons, George and Harry, who are the Virginians. These two boys were brought up by their widowed mother who, though she had married an English squire, chose to call herself Madame Esmond instead of Warrington. The lads were high-spirited and proud but devoted to each other. George, who was slightly the elder, accompanied General Braddock's expedition when it took the field against the French and Indians. It was ambushed and many were slain, and as George Warrington did not return it was feared that he, too, had fallen. Harry searched for him in bitter grief, then fell so ill of fever that a sea voyage seemed necessary to his recovery. This afforded an opportunity of visiting his relatives in England.

When he arrived at the ancestral seat of Castlewood in Hampshire his relatives were a disappointment. They were people of fashion, drinking, gambling and living beyond their means. Misled by the size of his estate as to the depth of his pocketbook, they, however, made much of the young Virginian. He, on his part, fitted into the life and spent extravagantly. Young and ardent in his affections, he was tricked into a promise of marriage by his cousin, Lady Maria Esmond, who was twice his age. Things went ill with our hero, who at last found himself lodged in a debtors' prison, with all his fashionable friends finding excellent reasons for forgetting him. In this dark hour of Harry's fortunes, George Warrington, his elder brother, landed in England. For long a prisoner with the French, George had escaped by the help of an Indian squaw and one of his French jailers, to whose descendants he had to promise a large sum of money. Madame Esmond was alarmed at the news of Harry's engagement to Lady Maria, and George was sent to effect his release. Harry's position as second son instead of heir made a great difference with many of his so-called friends, but George had to pretend to be a hard-hearted brother who would share nothing with his junior before Lady Maria would release Harry from his engagement. It is the elder brother's fortunes now that we follow in detail. He fell in love with, and married, a pretty lady, Theo Lambert, the daughter of an old schoolfellow of his mother. But Madame Esmond had hoped for a more ambitious match, and so for a while George Warrington and his lady lived in comparative poverty in London. George wrote, tutored, and begged of no one, till at last he fell heir to a fine estate in Norfolk which belonged in his father's family. He and his wife and children paid a visit to old Madame Esmond in Virginia, a visit that took place during the troubled early days of the Revolution. Until he could be assured of the old lady's security, George lingered on in America, but finally returned to England, to his wife, babies and estates, where we must leave him in great peace and contentment.

THE NEXT STORY OF LITERATURE IS ON PAGE 2865.



PHOTOGRAPHY WITHOUT A CAMERA

CONTINUED FROM 2652

MOST people think that nobody can take a proper photograph without a real photographic camera, but this idea is wrong. We shall see how any boy or girl can take a photograph without a camera.

In picture 2 there is a photograph of a lake scene, and on the next page is shown a picture of a little girl and a photograph of some leaves. Well, these photographs were taken without a camera of any sort. It took about half an hour to do them, and each one cost only a cent or two.

If we would like to do some like them, we must first go to a shop where they sell things for photographers and ask for a packet of "self-toning" paper. All photographic shops keep it, and it is not at all expensive. One packet will last a long time, and we can take twelve big photographs, or forty-eight little ones, about the size of the one on this page, with it.

Then we must ask for one pound of "hypo." This is also very cheap. That is all we need to take our photographs: just one packet of self-toning paper and one pound of hypo.

We open the packet of paper and find that it is shiny on one side. Now, if we cut a little piece off one sheet and take it out of doors into the light, we shall find that in a few minutes the shiny side begins to turn dark. We can watch it getting darker and darker until it is quite black. If we hold it by one corner, we shall see that the little piece our finger has covered will remain as white as it was when we first took the paper out of the packet. This is because the light could not reach the place which was shaded by the finger.

1. The photographing frame.

When we have done this we shall understand what photography really is. We shall see that we have a wonderful kind of paper which turns black when it is taken into the daylight; and, if we shade some parts from the light, those parts will remain white, while the rest of the paper becomes dark.

Now we can see that if we lay a leaf or a small flower on the paper, and leave it in the light for a little time, we shall get a perfect copy of that leaf. That is the way the photograph of leaves on the next page was taken, and it is quite a clear picture.

2. Photograph of picture taken without a camera.

Of course we shall find that the leaves, when we first pick them, are crinkly, and will not lie flat on the paper. We must press them closely to the paper by putting a piece of glass over them if we want our photograph to be clear.

The best way is to get a small piece of glass about 5 inches long and 4 inches wide. Probably we can find a piece in the house. A glass from an old picture or photograph frame will do quite well. Then we should cut a piece of thick cardboard the same size as the glass,

and get two strong elastic bands to hold them all together.

Now, whenever we want to photograph the leaves we first lay them on the glass, then put a piece of the paper over the leaves, and the cardboard over the paper. The two elastic bands slipped over the glass and paper, in the way that is shown in picture 1, will make everything ready for taking the photograph.

We have now only to take it all out into the light and leave it in the sun until the paper seen through the glass has turned quite black. Then we must take it indoors, and when we slip off the elastic bands we shall find a wonderful picture of the leaves, with all the delicate veins showing clearly.

3. A portrait taken without a camera.

Now, we must understand that this picture has appeared in this wonderful way because the leaves have shaded some parts of the paper while the other parts have been getting quite dark. If we take our photograph out into the daylight again, it will become dark all over, and the leaves will not show any more. We do not wish this to happen, so we must do something else before the photograph is really finished.

We must use some of our hypo. This stuff looks something like the soda we have seen in the kitchen. Well, we must take some of this hypo—about 2 teaspoonfuls will be enough—and put it into a soap-dish and pour some water on it. In a little time the hypo will dissolve in the water, and then we must put our photograph in it and leave it there for 10 minutes. It will turn red at first, but will afterward get dark again. When this is done, we take the photograph out and put it into a basin of water.

4. Photograph of leaves taken without a camera.

It is best to leave the basin under a tap in the sink, and let the water run into it for 2 hours; or, if we have a wash-basin with a tap over it, we can put the photograph into that. It must be washed in clean water for at least 2 hours, or it will not last. We have now only to take the photograph out and let it dry, and it is finished.

The drying is easily carried out by placing the photograph on blotting-paper or on clean absorbent cloth until the surface is dry. Then it is put between the leaves of a book so that it will be perfectly flat. Possibly the paper has been much larger than the object photographed, and in that case we take a sharp knife and cut the edges with a clean cut.

When we have done one, we shall probably like it so much that we shall want to do a lot more, so we must look for new things to photograph.

Perhaps when we were at the seaside last summer we brought back some pieces of that pretty pink seaweed. If so, we shall find that this makes lovely photographs. Some kinds of feathery grass make very pretty pictures, too; and little pieces of fern look lovely if arranged so that they group nicely before the photograph is taken.

We know one boy who is so fond of making these pictures that whenever he goes out into the country he brings home leaves from the different trees he sees. Then he photographs them, and puts the pictures into a little album, and underneath he writes the name of the tree each leaf came from.

Of course, there are lots of things besides leaves and flowers that one can photograph. We can copy pictures of people or outdoor scenes. Any picture from a book or a magazine can be photographed without a camera, if it has been printed on paper that is white at the back.

In The Book of Knowledge you will often find colored pictures. We can make a photograph of one of these very easily. All we have to do is to take the colored picture and put a piece of self-toning paper against it. Then we put them both between the glass and the cardboard, exactly as we did with the leaf or fern, and leave it all in the sunlight.

When we take the paper out we shall find a copy on the self-toning paper. We shall find, however, that the black lines of the picture are white in the photograph; and if we do not like this we must take another photograph from our photograph, and then everything will be right. We shall have a real copy of the picture, with the dark parts dark and the light parts light, just as they should be.

When our friends see how well we can take these photographs, they will probably ask if we cannot copy some portraits for them. This is just as easy if the portraits have not been stuck upon cardboard. If they have been "mounted," as photographers say, we must first soak them in water for a few hours and then peel them off the card. Then, when the portraits are dry, we can use them just as we used the pictures from The Book of Knowledge, and we shall be able to do just as many photographs of our friends as we want.

Remember, for copying other pictures we must take two photographs, because the first one shows the faces black. This first photograph that we get is called a "negative"; but when once we have taken it we can make as many photographs from it as we please, and the second ones will be just like the real portraits which our friends lent us in the first place.

If we keep copies of all the photographs we make, we shall be surprised to find how practice improves the results. We learn by experience how long an exposure to the sunlight is needed and how strong the hypo solution should be. This is a splendid hobby for boys and girls.

SUGGESTIONS FOR NAILING BOXES

DO you know how to nail a box so that it will hold? Observations of packages which have failed in service and tests on packing boxes by the United States Forest Products Laboratory have shown that the most common defect in box construction is inadequate nailing. Attempts to strengthen boxes by the use of thicker lumber without regard for nailing very often results only in waste material. The extra wood may not be needed so much as a few more nails. As an aid in determining whether or not a box is adequately nailed, the following helpful information is offered. It is found that the woods commonly used in box construction may be classified on the basis of their nail-holding ability and other desirable properties into the following four groups. All the species within each group can be used interchangeably as regards the thickness of material and the size and spacing of nails.

GROUP I

Alpine fir	Cottonwoo	Redwood
Aspen	Cucumber	Spruce
Balsam fir	Cypress	Sugar pine
Basswood	Jack pine	Western yellow pine
Buckeye	Lodgepole pine	White fir
Butternut	Magnolia	White pine
Cedar	Noble fir	Willow
Chestnut	Norway pine	Yellow poplar

GROUP II	GROUP III	GROUP IV
Douglas fir	Black ash	Beech
Hemlock	Black gum	Birch
Larch, Tamarack	Maple, soft or	Hackberry
So. yellow pine	silver	Hickory
Va. and Car. pine	Pumpkin ash	Maple, hard
	Red gum	Oak
	Sycamore	Rock elm
	Tupelo	White ash
	White elm	

Various tests have shown that cement-coated nails have a holding power from 10 to 30 per cent greater than that of uncoated nails. Smooth nails are more effective than barbed nails. The size or penny (d), of the nail to be used in any case is determined by the thickness and species of wood in which the point of the nail is held after driving. The following schedule is based upon the best, or so-called standard, cement-coated box nails. If the designated penny of the nail is not available, use the next penny smaller and place the nails closer together.

SCHEDULE OF NAIL SIZES

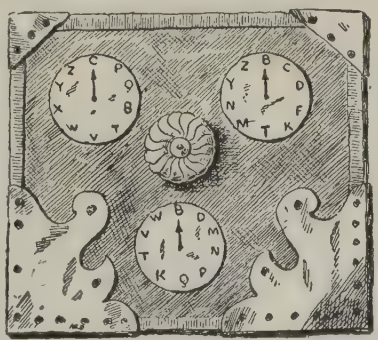
Species of wood holding nails	Thickness of ends or cleats to which sides, tops and bottoms are nailed							
	3/8" or less	7/16"	1/2"	9/16"	5/8"	11/16" or 3/4"	13/16"	7/8"
Group I	4d	5d	5d	6d	7d	8d	8d	9d
Group II	4d	4d	5d	5d	6d	7d	7d	8d
Group III	3d	4d	4d	5d	5d	6d	7d	7d
Group IV	3d	3d	4d	4d	4d	5d	6d	7d

You should space nails which hold boards to end grain of end about 1¾ inches apart, and nails which hold boards to side grain of end, about 2 inches apart, when nails are 6 penny or less. Be certain to increase spacing of nails ¼ inch for each penny over 6. No board should have less than two nails at each nailing end. Nails holding top and bottom to sides should be spaced 6 inches or more apart, when nails are 6 penny or less, and increased 1 inch for each penny over 6.

Although such spacing may appear to you to be too close, as a matter of fact, it calls for only about two-thirds of the number of nails which would cause excessive splitting of the ends, and approximately two-thirds of the number required to balance the strength of the nailed joints with the strength of the box in other respects. It is interesting to note that with the spacing suggested above, the nailing is still considered to be the weakest point of the ordinary box. You might check up on a number of packing boxes to find how many of them meet the standards given for nailing boxes.

THE PUZZLE OF THE SECRET LOCK

ONCE upon a time there lived a very rich man who possessed a great number of very valuable vessels, made of silver and gold. From time to time, however, thieves succeeded in entering his mansion and carrying off some of these precious vessels. He therefore decided that he must have them locked up more carefully than before. Accordingly he gave instructions for a very strong safe to be made, and arranged that it should have a secret lock. On the outside of the lock were placed three dials, each with a pointer and ten letters on it. Before anyone could turn the handle which opened the door of the safe, he had to turn round each pointer to a certain letter, a different one on each dial. We see what the lock looked like and what letters were placed on each face in the picture, which is reproduced from Mr. Dudeney's Canterbury Puzzles. Now, any thief who was endeavoring to turn the handle of the safe would, unless he were very fortunate indeed, take a very long time before he attained this object, because he might have to go through 999 combinations of letters before finding the right three. The rich man told the three letters to his two most trusted servants, and, in order that they might remember them the more easily, he said the three letters formed a word. What is the word?



The answer will be found on page 2879.

CAN YOU TELL THE REASON WHY?

THE GAME OF "WHY IS IT?"

HERE is a game which may be played in a very similar way to those described on pages 2168 and 2880. A boy or girl should read out the descriptions, and the game is to explain the causes. A large number of the answers should be quite well known to readers of this book. They are, however, given on page 2881.

SHOULD THE RAILWAY LINES JOIN?

1. There is a little path across a meadow near our home. It leads down to a railway cutting, and, sitting on the fence at the end of the path, we can look down on to the railway lines. Yesterday some of us were waiting there to see the express pass, and we noticed that where two rails joined end to end they did not quite meet. There was a space of about a quarter of an inch between the ends. Could it be a mistake of the workmen who laid the rails? When the express had passed we looked out for the joinings of other rails. There was always a little space left; so it seemed to be done on purpose. Why?

THE PUZZLE OF THE LOOKING-GLASS

2. One day a little girl was sitting in the corner of a room on the same side as the door, so that when anyone opened it she could not see the person's face; but she found that all she had to do to find out who was coming through the doorway was to look in a mirror on the opposite wall. There she could see quite clearly the face and head of her friend, but she could not see herself in the mirror at all. When she got up from her seat and walked to meet her friend, she looked in the mirror, and so did her friend. They found they could see each other in the mirror as they advanced, but their own faces were not seen until they were opposite the mirror. They are puzzled about this. Can you help them with the reason?

THE SHELL THAT SEEMS SO NEAR

3. In the summer holidays, when we were bathing one sunny day, and there was hardly a ripple on the water, we could see the sand clearly at the bottom. Now, a funny thing happened. As we came down the steps of the boat-house to get into the water, the lower steps under water seemed quite near, and we thought the water must be very shallow; and yet we went down and down until the water reached up to our waists. There was a shell lying in the sand a little way out, which looked easy to pick up, but was really too deep down for our arms to reach without dipping our faces down under water. We tried with the other arm, but it was no good. What was the matter? Had our eyes all made mistakes and deceived us?

THE COLORS ON THE CEILING

4. A little boy had been ill with measles and went to stay with his grandmother. He had to lie still on a sofa at first, until he grew strong. One day he was looking at the ceiling and saw some beautiful colors there in a row —red, orange, yellow, green, blue, indigo, violet. How did they come there? They were lovely pure colors, far nicer than those in his paint-box, and reminded him of those in a rainbow. But he saw no rainbow out of the window. He rubbed his eyes. No, the colors were still there. Then he said their names over to himself until his grandmother came. What do you think she said had made them?

VOICES FROM THE ROCK

5. High up on the Alps in Switzerland people want to send messages across to the mountain on the other side of the valley, or at the bottom of it. But it takes long to walk, so they have found a way of calling to each other. See! there is a mother standing at her cottage door, wanting to call to her son, who, she knows, is far below her down the mountain. With both hands to her mouth she sends forth the cry "Come home!" not straight down to him, but toward a rock below on the opposite side of the valley. Then she waits. After a few seconds she hears the answer "Coming," not from below her, but from the opposite rock. Why did she not call straight down to her son?

THE SCENT AND THE BOTTLE

6. Someone gave a little girl a large bottle of eau-de-Cologne for a Christmas present. That scent is sometimes refreshing to anyone with a bad headache. The other day the little girl's mother had a headache, so she brought the scent for her, and dabbed some with a handkerchief on her mother's forehead. She left the corner of the handkerchief in the wide neck of the bottle on a side table and forgot all about the bottle. Next morning she went to seek it, but found that much of the eau-de-Cologne had disappeared. The handkerchief was wet, as though it had been soaked with scent. It was puzzling to know how the scent got out of the bottle. Do you know why it could not help getting out?

WHERE WAS THE MUSICIAN?

7. One windy afternoon a small boy invited his sister and her friends to visit him in the attic which he used for a playroom. Suddenly a burst of beautiful sound as if someone were playing chords on a harp filled the room. The girls were surprised and pleased, and they asked the boy to produce his friend the musician. Just at that moment the wind outside rose to a gale and the music changed to the most ear-piercing shrieks and discords, as if all the cats in all the back yards of the world were cater-wauling at the same moment. It was distressing and rather frightening too. The boy laughed, however, and telling them there was nothing to be afraid of, he invited them to search the attic for the cause of the sounds, which had again changed to the most beautiful harmonies. The girls turned the attic inside out and looked into every old trunk and box, but found no one. How did the boy explain the music?

GAMES FOR TINY CHILDREN

BIG boys and girls will not want to come with us now, for we are going to have fine fun and frolic with the very little people.

HUNT THE SLIPPER

ALL the players but one—"cobblers," as they are called—sit on the floor in a circle a few inches apart. Then the customer comes and says: "Please, I want this old slipper mended. I will call for it in ten minutes."

She hands one of the cobblers an old slipper, and turns away. When she has counted up to ten she comes back, but is told that the slipper is not ready.

"I must have it," says the customer.

"Then you must find it," all the cobblers reply.

At that the search begins. Each cobbler passes the slipper on to his or her neighbor, hiding it from sight as much as possible; but should the seeker spy it and call out the name of the cobbler who has it, that cobbler must take her place, and bring it to be mended again. The slipper must not stop in one place, but must keep passing around in the circle either one way or the other.

THE GARDEN GATE

THE garden fence is made by all the players, except one, holding each other's hands, standing in a big ring. In the middle stands the single player, while the rest dance around her three times. Then they stand still while she sings:

"Open wide the garden gate, the garden gate, the garden gate,
Open wide the garden gate and let me through."

But the "fence," as the ring is called, only answers, as it dances round again:

"Get the key of the garden gate, the garden gate, the garden gate,
Get the key of the garden gate and let yourself through."

Then the poor prisoner cries:

"I've lost the key of the garden gate, so what am I to do?"

Still dancing, the others sing:

"Then you may stop, may stop all night within the gate,
Until you're strong enough, you know, to break a way through."

At this the prisoner runs between two of the boys and girls—the "palings" of the fence—and if, by pushing, she can make them unclasp hands, one of them takes her place in the middle, and the game begins again.

HUNT THE RING

THIS game is played by all the boys and girls standing up in a circle, with the seeker inside. The ring is slipped on a long piece of thin cord or twine, the ends of which are then tied together. Each one in the circle holds this cord with one hand and passes the ring along it with the other. The game is to pass the ring along while the seeker is looking another way. The ring may be hidden by holding the hand over it till there is a chance to pass it on. The ring must not stay in one place, and when it has been found, the one who held it must take the place of the seeker.

HOLD FAST! LET GO!

YOU must listen to what is said in this game and be careful to do exactly the opposite. Four players stand up, and each takes hold of one corner of a square sheet of paper or of a handkerchief. A fifth player calls out: "Hold fast!" and anyone who does not let go will be out; while, if the order is "Let go!" those who fail to hold fast will be out. The orders must be given rapidly, one after the other, and someone is sure to make a mistake, but the last to do so, of course, is the winner.

PUSS IN THE CORNER

IN this game all the children pretend to be mice, except one, who is the puss. "Puss" stands in the middle of the room. Each mouse stands in a corner. While they are there Puss cannot touch them, but when they run across the room to change corners with one another she may capture any she can. No mouse should venture from a corner until she has made signs to another mouse with whom she would like to change houses, or she may find herself halfway across the room with no corner to run to. The mouse who is caught must take the place of Puss.

DUCK UNDER THE WATER

THERE should be a good many players for this game. Choose partners, and form two lines a little apart, each couple standing one behind another. The front, or leading, couple then form an arch by joining hands, and the last two of the line skip together down the alley of players, pass under the arch, and stopping immediately on the other side, make a second arch. Then the next couple from the end do the same, and the next, and so on, until a long tunnel is formed of lifted hands. The tunnel may be taken down by the first partners who began it lowering their arch and passing through. The next two follow, until the last arch falls, and the builders are ready for another game.

BLINDMAN'S BUFF

THOSE who want to make a great noise will have a chance now. One player is taken into the middle of the room, where a handkerchief is tied over his eyes. He is then turned round three times and told to catch whom he can. The other players run to and fro, passing as near to him as they dare, while the blindman rushes in all directions, clutching at those who seem nearest. When he succeeds in catching someone, he must guess who it is, and, if correct, the person caught must be blindfolded in his place. If he cannot guess, he must let go and try again.

WOLF

THE "wolf" is a player who creeps away to one side of the nursery and hides behind chairs, tables or boxes. The "sheep" all huddle up at one end of the room, and the shepherd stands at the other. Presently he calls out to the sheep to "come home, for the night is falling."

"We are afraid of the wolf," answer the sheep.

"The wolf is away!" cries the shepherd.

Then the sheep all run across. Out jumps the wolf and catches whom he can. The game lasts till there are no sheep left to be caught.

BINGO

THE music for the song is given on page 1890.

The players join hands in a ring, with one of their number, who is called the "farmer," in the centre. Then all, still holding hands, dance around and sing:

"A farmer's dog leaped over the stile,
His name was little Bingo:
B with an I, I with an N, N with a G, G with an O,
And his name was little Bingo."

Then as they stand still again the farmer cries out "B" and points at one of the players in the ring, who must say "I," the next to her "N," and so on, until the little dog's name is spelled. The first player to say the wrong letter has to change places with the farmer.

FEATHER AND FANS

A FLUFFY feather out of any cushion will do for this game, and if there are not enough fans to go round, stiff pieces of paper or thin card will do as well. Draw a line across the nursery floor and let half the number of players be on one side and half the number on the other. When all are ready, toss the feather into the air and keep it up with the fans. No players must leave their side of the line, but should do their best to stop the feather sailing across it. Those in whose country it falls at last lose the game. Of course, the feather while in flight must not be touched.

A GOOSE MARCH

ALL the players but one, who is the officer, form in a line one behind the other, but a little way apart. When ready, the officer cries: "March!" Away go the soldiers at a rapid step, till suddenly the officer calls out: "Halt!" Anyone who bumps against his companion in front, or has both feet on the ground, is sent to the back of the line with a bad mark. The order to "March!" or "Halt!" is given as many times as there are "soldiers," and in the end the bad marks are counted, the one with the smallest number being the winner.

BRIDGE-BOARD

A BRIDGE-BOARD is a long thick piece of wood with a number of arches cut in it. If we have not one, we can build a very good board from a box of bricks, or even by standing our smaller books in a row, and placing others across the tops. Each arch, or opening, of the bridge should be marked with a separate number, and one of the players, called the "keeper," should stand by it at one end of the room, while the rest go to the other end with marbles. Turns are then taken to roll the marbles through the bridge, the one who sends them under the arches with the highest number winning the game. When we build our bridge we can make the arches whatever size we like. They should be large if we choose to roll the marbles from a distance, and small if we are going to stand near.

A HOUSE PAPER-CHASE

FOR this game we shall need a large number of pieces of square paper about the size of a playing-card. On each slip a figure should be marked plainly—thus, 1, 2, 3, and so on, up to 20 or 30. These slips are given to the boy who is the "hare," with permission to drop them one by one, in the order of the figures, anywhere he likes in the house, but always where it will not be very difficult to see them. After waiting a minute or two the hounds start in pursuit, but must follow him only by finding the scraps of paper in their proper order. The hare does all he can to avoid being seen until he is safe back home at the starting-point, but even if seen, he cannot be caught unless the hounds can produce all the slips of paper that he has scattered. If they make a prisoner of him, and he can show that there are numbers missing between those he still has and those in the hands of his captors, he must be set free again. If there are only one or two thus missing, the chase becomes exciting, because he must not return home till all his slips are parted with.

HICKORY, DICKORY, DOCK

DRAW a large circle on a slate with a very small one in its centre; then from one to the other draw lines like the spokes of a wheel, and number the spaces between the spokes from 1 upward. The more spokes and spaces, the better. In the small inner circle 100 is written. The first player then begins by holding a slate pencil upright with its point in the space marked 1. Closing her eyes, she shifts the pencil round the wheel step by step, repeating these words:

"Hickory, dickory, dock,
The mouse ran up the clock.
The clock struck one,
Down the mouse ran,
Hickory, dickory, dock."

With the last word she opens her eyes and writes down the number of the space in which the pencil is resting. The next player then takes the pencil and begins, and when all have had a turn the scores are counted up, the one who has the highest number winning. Any player who puts the pencil into the inner circle scores 100, and wins at once, while those who let it rest on a line or spoke must pass it on to the next without counting anything.

SCHOOLMISTRESS

THE mistress stands in front of the class and, beginning with the scholar at the head of the class, asks questions as quickly as she can think of them. She begins with the

letter A, and forms her questions so that the answers begin with this letter. For example: "The name of an English queen beginning with A." If the answer is not given before she can count up to ten, she goes to the next scholar, and the next, until one is reached who replies. This scholar goes to the head of the class, and another question is asked on the letter B, and so on through the alphabet. It is *quickness* more than anything else that makes the fun in this game.

THROWING LIGHT

TWO players secretly choose between them a word that has two meanings, such as "ball"—a thing to play with, and "ball"—a dance. They then begin talking to one another aloud, referring to the word without using it. One will say: "I played with it in the garden this morning." "Yes," says the other, "and a friend of mine went to one last night."

Those listeners who think they have guessed what the word is may join in the conversation, but must pay a forfeit if mistaken.

TELEGRAMS

ONE of the players calls out that a telegram of ten words has to be sent off describing, let us say, the boat race, and the words must begin with certain letters. He mentions ten letters of the alphabet which he has chosen, and each player puts them down on a slip of paper. Five minutes are given for the writing of the telegrams, and when the time is up they are all read out aloud. Clever players sometimes make very funny telegrams, and a great deal of fun can be got out of the game. A prize can be given for the best telegram.

THE GENTEEL LADY

THOSE who take part in this game must have very good memories. It is begun by the second player from the left-hand end saying to her neighbor on the right: "Good-morning, genteel lady, always genteel. I, a genteel lady, always genteel, come from that genteel lady, always genteel (pointing to the girl on her left), to tell you that she owns an eagle with a golden beak."

The neighbor receives this information with a bow and repeats it to the girl on *her* right, adding at the ends of the words "and silver claws." This third player then bows and passes it on, adding to the sentence a remark about the eagle's feathers. Each player adds something of her own, and the first girl who fails to repeat, word for word, the message she receives has a paper spill, called a horn, stuck in her hair. The player sitting next then turns to her right-hand neighbor and takes up the tale in these words: "Good-morning, genteel lady, always genteel. I, a genteel lady, always genteel, come from this *one-horned* lady, always one-horned, to tell you," etc. Every mistake means a fresh horn, and the game often ends by all "genteel ladies" becoming "one-horned," or "two-horned," or even "four-horned," because with every repetition the words get more difficult to remember. Sometimes players laugh so heartily that they forget the words.

POST GENERAL

ALL the players sit around the room in a large circle, and one, who is blindfolded, stands in the middle. Each player takes the name of a town, and the leading player makes a list of these, from which he calls out now and then, thus: "The Express is going from Boston to New York," choosing towns on opposite sides of the circle. Boston and New York jump up and slip across to each other's seat, the blindman doing his best to catch one of them as they pass. When several towns have changed places, and the blindman has failed to make a prisoner, the leader cries out: "All change!" Then all must jump up and cross over to opposite sides. In the hurry and confusion the blindman is sure to catch someone, who takes his place, and he becomes one of the towns.

WINKS

A CIRCLE is formed of chairs, only one of which is unoccupied. Behind each chair, including the vacant one, stands a player whose duty it is to prevent the person sitting in front from leaving his chair, though no effort must be made to check him until he shows some intention of escaping. The guardian of the vacant seat looks round the ring and winks to someone to come and occupy it. The player thus called must be very alert, or the one behind the chair will clutch him before he can get away. One touch is enough. If he is successful, the chair left becomes the vacant one, and the player behind it must lose no time in trying to get another tenant by a wink or a nod at someone else. The faster the changes take place, the greater the fun, but the guardians behind the chairs must, of course be as quick as they can to avoid losing their charges. This is an exciting game.

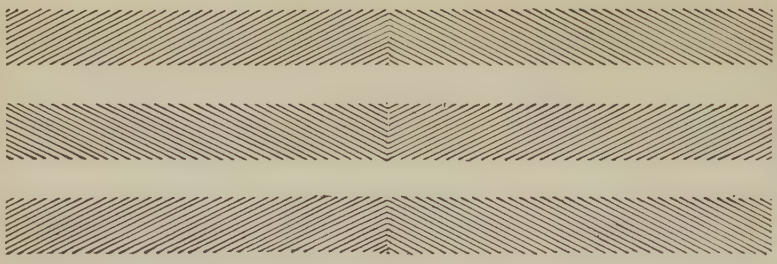
OBJECT GAME

THIS is good practice for the memory and the power of observation. Each member of the party has a piece of paper and a pencil. When all are ready, someone enters the room carrying a tray with about twenty small articles on it. The tray is placed in full view of everybody and left there for one minute, during which time no one must touch pencil or paper, but must simply look at the contents of the tray. At a given word it is carried away, and the players must write down the names of as many of the articles as they can remember having seen. Only a certain time is allowed for this, and those who remember the greatest number of articles win the game. The objects chosen should be of the simplest kind—a black pin, a tiny piece of coal, some bird seed, a piece of fluff, a hair, and so on.

YOU MUSTN'T LAUGH

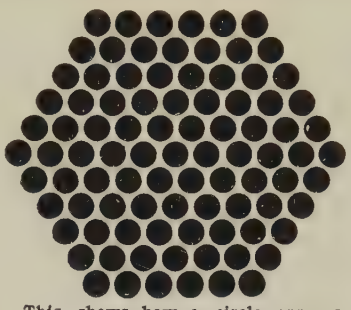
ALL sit in a row round the fire and look solemn. Then the first player says: "Haw-haw!" which is repeated all down the line, one after another. Those who cannot do this without laughing afterward are declared out, and the game begins again.

CAN WE ALWAYS BELIEVE OUR OWN EYES?



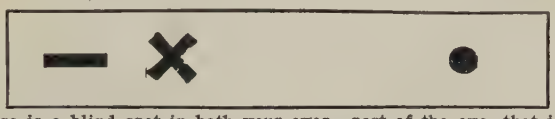
If you fix your eyes on the two white spaces between the lines it will appear as if the top space becomes wider at the ends, and as if the bottom space becomes wider in the middle. But both lines are perfectly straight.

Which line is the longer? The black line on the right appears longer than the line beside it, but both lines are exactly the same length.

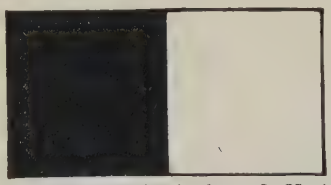


This shows how a circle appears to have sides and corners. These black spots, if looked at intently, seem to have six sides, like a honeycomb, but they are all quite round.

Who is the biggest? The policeman, most people would say. But the policeman is really the smallest and the little girl is the biggest. This curious effect was first used by a clever artist for Pear's Soap.



There is a blind spot in both your eyes—part of the eye, that is to say, is blind. You can prove this by closing your left eye and looking at the X with your right. Hold the paper a foot away, and draw it toward you. Though looking at the X, you will see the spot too, but at a certain point the spot will disappear. By drawing it still nearer to you, you will bring the spot into view again.



Which square is the larger? Most persons would say the white, but the white is smaller than the black.

One of these sets of lines looks higher than it is wide, and the other wider than it is high, but both are square.

Turn the page round and round to the left. The plain rings will appear to revolve rapidly to the left, and the others to go slowly round in the opposite direction.

The poet was perfectly right when he said that things are not always what they seem. We cannot always believe our own eyes. Our vision of things is never quite perfect. There is always a little error in our sight. This page shows how we may deceive our eyes and believe that things are not what they are.

THE NEXT THINGS TO MAKE AND TO DO ARE ON PAGE 2875.

MORE WORTHWHILE GAMES

CONTINUED FROM 2524

TESTING GAMES FOR READING AND WRITING
DRAWING PUZZLES—WRITING AND DRAWING GAMES

I SHOULDN'T be surprised if you can read and write with all the words in your dictionary. You know how to find out about it. You can test yourself to see if you know what the words say. Just take any group of words and say each word, then look at the picture on the back. If you are right, put the card in the "I know" pile. Count the number of cards in the "I know" pile for your score. This score tells you how many words you can name.

To find out how many you can write, take the same group of words to the blackboard or easel. Look at the picture and write the word the way you think it is. Look at the back and see if you are right. If so, put it in the "I can write" pile. Count up the cards in this pile for your score. It tells you how many words you can write.

Take another set of cards and do the same thing. On another day take more sets of cards until you have gone through all the words in your dictionary. You will then know how many of them you can tell, and how many of them you can write. On the next page you will find a good way to make records of your scores. They will show how much better you are learning to read and write the words in your dictionary.

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Words with which I can read and write.

Words	Date	Score	Date	Score	Date	Score
Animals	January 4	10–2	January 9	10–8	January 15	10–10
Colors						
Things we do						
Things we eat						
Numbers						
Things to play with						
Words that begin with b						

Mother will be glad to write in the date for you or let you take her date punch to stamp it with, if she has one. The numbers in your score tell you how many words you tried to say or write and how many words you did say or write correctly. The first number tells you how many you tried, and the next one tells you how many you scored. So 10–2 means that you tried 10 words and had 2 right. The next time, you tried 10 and had 8 right, and the last time you tried 10 and had them all right.

You can find out how many of the words from your pink pile you can read and write with, in much the same way. You will have to ask mother, or someone who knows the words, to help you. To find out how many you can read with, mother will have to tell you which ones you have right. To find out how many you can write with, she will have to look at each card and tell you the word to write. Then you write it and look at the card to see if you can score it.

In about a week or two weeks, if you try again, you will see how much better your score is. That's why it is a good plan to put the date in your record, so you can see how much you have learned in that time.

You have learned to write words so that your playmates can tell what word you are thinking of. And you have learned to write stories which they can read and know the story you are thinking of. Can you also draw pictures of things so they can tell what it is you are

thinking of? And can you draw a picture story so they can read out of it the story you are thinking of?

Let's try some puzzles and see how well you can draw. I'm thinking of something people eat for breakfast. Draw the answer to my puzzle. You will score one if I can tell what you have drawn. You will score two if people really do eat it for breakfast. You see, these are thinking puzzles as well as drawing puzzles, so you score one for thinking right and one for drawing right. Now you may be leader and you may make your puzzle as easy or as hard as you wish. I will tell you some puzzles other children have made. You can try them and then make some new ones of your own.

I am thinking of things that have four legs.

I am thinking of things that live in the water.

I am thinking of things that go in the water.

I am thinking of animals that climb.

I am thinking of things that have wheels.

I am thinking of things that the wind makes go.

I am thinking of tools we use.

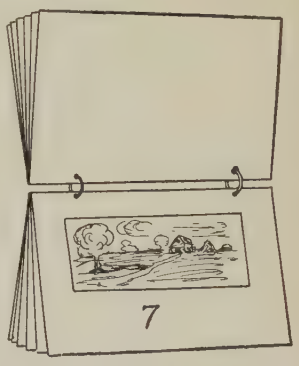
I am thinking of things we wear.

These puzzles make you think, don't they? But it's no fun to play a poky game. You like to think quickly and draw quickly, too. How much time do you think the leader should give for each turn? Figure this out any way you think best. Decide on the time you need and make a rule about it so each leader can use the same rule. You can use your sand timer if it helps you keep the time. Of course if you have a watch with a minute hand you can keep time with it.

DID you ever hear the story that Mr. Kipling wrote about the first picture writing? Perhaps mother or daddy will tell it to you.* The little girl in the story was out on a fishing trip with her daddy. He broke his fishing spear and she did not want to go home for another. While her daddy was trying to mend the broken spear, a strange man came by. She wanted to ask him to go to her home and ask her mother for her daddy's other fishing spear. But he could not understand her, so she drew a picture to tell him about it.

This is what she thought her picture said: "This is the way to go to my mother's house. My daddy has broken his fishing spear, but mother will give you his other one."

This is what her mother thought her picture said: "This man has thrown his spear at my daddy. Daddy wants you to bring all the people you can to help him."



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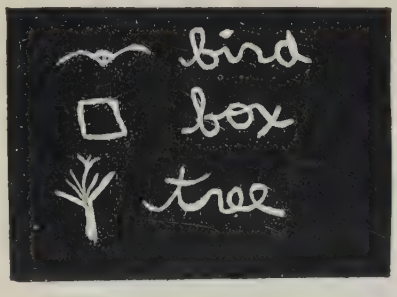
So the people were very unkind to this man who was trying to help them, until finally they got back to the little girl and she explained her picture writing. I wonder if your pictures clearly say what you want them to say.

YOU know, pictures are like words and stories. You have to learn to read them and to write with them. When you can draw word pictures so people can read them, you can learn to make whole stories out of them so people can read them. I know you can read picture words for you do it all the time with your dictionary. How well can you read picture stories?



Look in the magazines for some pictures which tell you interesting stories. Mount ten or twelve of them on stiff paper or cards. Put a number on each page and fasten the pages on rings. Put the same numbers on little cards.

*Just So Stories.

Tell your playmate to draw out any number card but not to show it to you. Tell him to look on that page in the picture book and tell you three things about the picture story, and then shut the book.

Then you open the book and look for the picture he has been telling about. If you can find the same picture you will know by matching the number on the page to the number on his card. You score one for reading the picture well enough to find it. He scores two for reading it and then telling you about it so you can find it.

HERE is a game in which you can find out how many word pictures you can draw so well that people can tell the words.

Get one of your playmates to play with you. Each of you take any set of cards from the dictionary, the animals, the things you eat, the things you do, or any other set you wish. Or perhaps you would rather take out the cards in front of a b c or m n o or some other group of letters. Just be sure that you take words you can read and write. Put your pack on the edge of the blackboard or easel with the word side up. Draw what the first word says. Then put that card at the back of your pack. Draw the next one and put it at the back of your pack and so on until you have drawn them all.

Then comes the fun. You take your playmate's place and he takes yours. You write beside each of his pictures the word you think it says. He will do the same with your pictures. Go back to your own places and see how many of your pictures told your playmate what you meant to tell. That is your score.

LOOK at the houses on the next page. You would know they were all meant for houses, but some of them say "house" much better than others, do they not? Are your houses as good as the first one, the second or the third? And your people? Your compositions? You can make your pictures talk better if you practice.

NOTE TO MOTHERS: Here the child begins to use a standard of skill in his drawing. Up to this time his standard has been utility. He has drawn well enough to serve his purpose. But now he is desirous of doing "better," and of doing "the very best I can." So we are introducing a very simple scale for some of the simplest objects he will use most in his drawing.

VERY GOOD

VERY GOOD

GOOD

GOOD

HOUSES

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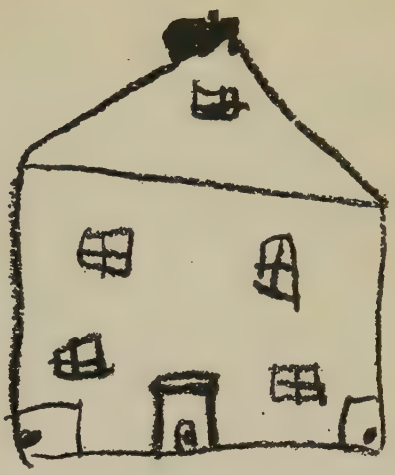
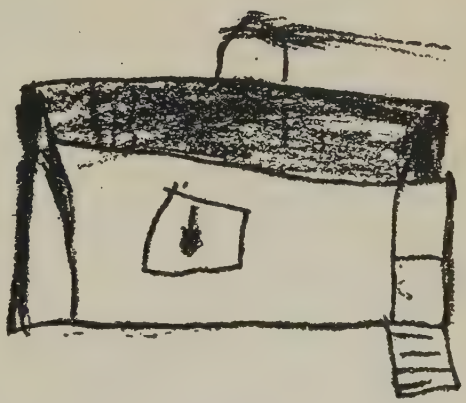
FAIR



FAIR

POOR



POOR

HOUSES

VERY GOOD

VERY GOOD

GOOD

GOOD

GOOD

FAIR

POOR

POOR

POOR

PEOPLE

VERY GOOD

VERY GOOD

GOOD

GOOD

FAIR

FAIR

COMPOSITIONS

THE NEXT HELPS TO LEARNING ARE ON PAGE 2883.

THE GLORY OF THE PLUMAGE OF THE BIRDS

The magnificent tail and wing feathers of the Sun Bittern.

A young Cockatoo.

The Ostrich.

The Kagu.

The proud Peacock.

The handsome Ruff.

The pictures in these pages are by J. T. Newman, Herbert G. Ponting, Seth Smith, H. C. Wood and others.

Nests and eggs of the Shrike, the Partridge and the Swift.

OUR FEATHERED FRIENDS

CONTINUED FROM 2595

MAN has finally reached his long-sought goal. He can leave the land and sail the air in any direction he chooses. He has flown across the Atlantic. We marvel and admire, and are proud of the success of our race. Then we look up at a bird and are humbled.

We scour the earth for materials to build an airplane. We put into it the highest art and the newest discovery of the scientist and the craftsman. We spend thousands of dollars on one machine and commit it to the care of men. They must be experts in mechanics, driving and navigation, men of the most robust constitution, with nerves like steel, and we pray that fortune may be kind to our venture.

Then we watch a sparrow mount straight from our feet to a chimney stack, or a lark spring vertically into the heavens; or we see a shrike hang as if motionless in the air, its wings vibrating rapidly. We see it pounce sheer down to earth. Or we see a bird come home from a tireless journey of five hundred miles, sustained on its way by a few ounces of food and a sip or two of water. Clearly the birds are still our masters in the air.

The men who study birds are called by the long name "ornithologists." They have pointed out to us some very strange likenesses between our beautiful birds and the reptiles.

They show us that birds have scales on their legs which match the scales of reptiles; they have a horny beak similar to that which many reptiles have. Many of their bones are filled with air-sacs; they have a third eyelid. Even more important, they say, is the shape of the red corpuscles of the blood.

We have already seen how the bats mastered flight, and how many other animals—squirrels, lemurs, and the rest—progressed in the same direction as far as gliding and parachuting. The earliest forerunners of the birds began their aerial career in much the same way.

Once there were scaly reptiles which had business in trees and about the rocks, in pursuit of prey, and in eluding enemies. Perhaps in their haste they leaped and flopped down from a height, until in time they developed leathery wings and achieved true flight, as perfect as that of the bat, and with wings of the same sort.

It is probable that next to the insects, they were the first creatures to soar from the land and make the air their own. They were a terrific host, and hideous, judging by their remains. They were grim-looking beasts. For a long time it must have been difficult to decide where reptile ended and bird began. Researches in the rocks have

not revealed the full story, but we have many interesting facts.

THE EARLIEST OF ALL THE BIRDS, WITH THE TAIL OF A LIZARD

We have the remains of the Archæopteryx, the first bird, upon which to base our understanding. Only two examples have been found, imbedded in a Bavarian limestone used for lithography.

The archæopteryx was a bird about the size of a crow, with many teeth. It was feathered all over, except on the legs and the beak. The fossil remains show that the feathers were as perfect as the modern bird's. But, instead of a tail of feathers the archæopteryx had the tail of a lizard, composed of over twenty vertebræ covered with thick flesh. From each joint of this primitive tail there sprang a pair of feathers. Moreover, the wings bore strong claws with hooked talons, which helped the bird to climb when not flying. We know its purpose well from the fact that the nestling Hoatzin, a very primitive bird flourishing in South America, has wing claws much resembling those of the older types. When alarmed, the ugly fledgling flops out of the nest, drops into the water below, swims and dives at the first attempt with the confidence of a little cormorant. When its foe has been evaded, it regains its cradle by hooking itself up, branch after branch, by means of these strange surviving implements preserved from old time. Each little hoatzin seems to show, in the course of its individual life, the progress of the whole nation of birds.

A WONDERFUL COLLECTION OF BIRDS THAT LIVED LONG AGO

Europe was the home of the archæopteryx, but we cannot say that it lived in Europe only; nor can we say where birds were first found. America affords the next example of bird-like forms. Chance discovery brought to light fossil remains of the Pterodactyl and other winged reptiles. They had lived and died on the eastern slopes of the Rocky Mountains—then only the summits of islands rising from an inland sea. Professor Othniel C. Marsh of Yale University gave up years of his life to exploration among the fossils of the past of the bird world. His perils were little less than those of the very first explorers: sunstroke, fever and other illnesses in summer; frost in winter; and Indians always ready to scalp and murder the curious intruder.

But the professor brought to light a collection of 150 birds which flew and swam when the Rockies were island peaks. He told us of the Hesperornis, a bird three feet high, with a long, supple neck, with a multitude of teeth set in grooves in the bill; with the lower mandible divided in front and held together by a ligament, as in the snakes; with wings so inefficient that the bird can have flown little if at all.

Then there was the Ichthyornis, a bird about the size of a pigeon, toothed, but with the teeth in sockets like the reptile's, equipped with powerful wings. These birds are extinct. The scientist, with these and other links in the chain, can identify birds existing to-day as descendants of specimens which rocks and clays have yielded. But we must pause no longer in the company of the dead, but see to what glories the race has been brought in the splendid birds about us.

The average bird is the very embodiment of vigor and alertness. The intense ardor of bird life must have come from the development of the four-chambered heart which all birds now have. This prevents the mixing of impure and sluggish blood from the veins with the rich blood of the arteries.

THE MARVELOUS ENGINE THAT HEATS THE BODY OF THE BIRD

Mammals have attained only to the condition of warm-blooded creatures; the birds have become hot-blooded. Their temperature ranges from 100° in the gull to 112° in the swallow. This temperature would be swift death to us, whose temperature should be always less than 100°. Associated with this high level of bodily heat in birds is a heart which excels the most marvelous engine ever devised by man. A bird's pulse, as we may say, may be 120 beats a minute when the bird is at rest. At the end of a flight the heart beats so rapidly as to make it impossible to count the pulsations. The human pulse averages 72 beats a minute.

This is as far as we shall be able to speak of the details of bodily structure. However, we must note that the flying birds, but not the running birds, have breast-bones formed like the keels of ships, to which the muscles that raise and lower the wings are attached. The feathers are wonderful in structure; a single feather may contain as many as a million tiny particles. The purpose of such a contrivance is manifold. Some are clothing,

THE BEAUTY OF THE BIRDS ON THE WING

The Puffin.

The Arctic Tern.

The Rook.

Gulls on the lookout for a meal.

Graceful Albatrosses alighting on the water.

some purely decorative, some solely for flight. Those for flight are so constructed that the air can to some extent pass through them as the wing is raised. The feather particles close, like so many tiny trapdoors, as the wing is lowered for its power stroke.

THE BEAK OF THE BIRD ONE OF THE MASTER TOOLS OF NATURE

Feathers wear out after the fashion of hair, wool and fur, and must be replaced. So birds molt, some yearly, some each spring and autumn, some three times a year, as in the case of the ptarmigan. Most birds lose their flight feathers a few at a time and so are always able to fly; but there are those, like the swans and ducks and flamingoes, which cast all their flight feathers at once. They are then as helpless as penguins for flight. At such seasons the birds wear what is known as an eclipse plumage, and seek safety in hiding.

Birds claim our admiration as the first of backboned creatures to build homes. After long ages, the beak has come to rival the hand of a man and the trunk of an elephant as a tool. It brings food, it fights for life and conquest, it gathers material for the homes and weaves it into marvels of neatness, beauty and efficiency. The beak is a tool for burrowing and excavating; it builds nests of mud; it raises high-piled nests on giant trees for the lordly eagle; it sews leaves together to make a nest like a living goblet for the tailor bird; it gives the weaver bird a delightfully woven house, and the kinglet a nest that a fairy might covet, beneath a bough; it decorates the daintiest for the humming-bird; it raises island sites for water birds.

THE INGENUITY SHOWN BY THE BIRDS IN PROTECTING THEIR EGGS

The nests are mainly nurseries. Some birds remain out on the water for months together when their babies are reared, and others are content to roost wherever they find lodging at the end of their parental duties for the year. To make the world safe for baby nestlings is the chief care of the adult birds. Nature has gone to extremes of ingenuity in this. She has provided a scheme by which every egg fits its surroundings. Instinct impels a bird laying conspicuous white eggs to secrete them in holes, and we suppose there must be purpose in the coloring of eggs. A sea bird, safe on its precipitous shelf above the waves, may have but one egg. Sometimes this is so marvelously balanced with the weight at one end that if disturbed it is not likely to roll to destruction, but usually revolves and comes to rest.

The bird which has little to fear has few eggs. The bird whose progeny are exposed to many dangers may produce a score; but the care and devotion of nearly all species is the same. Certain birds, like the brush turkeys, construct a mound of decaying vegetation, and leave their eggs to be hatched in a natural incubator. Other birds, like some cuckoos, place their eggs in nests built by other birds, and tragedy follows the hatching of the intruder.

THE MOTHER HEN THAT WILL DIE FOR THE SAKE OF HER YOUNG

Generally, however, the parent birds are as devoted in the care of their eggs and their young as a lioness is of her cubs. A sitting hen is lost to everything but this duty. She may remain steadfast at her post when her nest is invaded. She will submit in some cases to be burned to death rather than forsake her charge. Nothing matters but her eggs or her little ones.

Such devotion must spring to some extent from the nobler processes of the animal mind, but we know that instinct plays its part, for at the time when she should hatch her eggs a great heat develops in the breast of the sitting bird; her brood patch is hot. While this is essential to the maturing of the eggs, it cannot be without effect on the disposition of the bird itself. In natural conditions she must brood.

THE SPLENDID WORK OF BIRDS FOR THEIR BABIES AND MANKIND

When the wait is ended and babies come cheeping from their shells, the labor of the parents is not yet at an end. The bird, which is not to fly far, but to strut through life within limited boundaries, is generally born far advanced and able to feed itself within a few hours of birth. But the birds which are to charm the world with song come into the world as helpless as a human babe. To feed them the parents must work almost to exhaustion, flying to and fro between the nest and the feeding-ground to bring nourishment to stay such hearty appetites. The very fact of that enormous appetite makes the birds of high value to men.

THE CHICKS OF OUR FEATHERED FRIENDS

A mother Tern out with her baby.

Young White Storks.

Young Tinamous.

A young Barn Owl.

McCormick's Antarctic Skua with her chick.

Nearly all nestlings require insects—caterpillars, slugs, grubs, flies, midges, beetles—all the things that help to ruin the crops we laboriously cultivate. Millions of our natural enemies in gardens and fields and pastures disappear every year down the throats of clamoring nestlings. But for such help, we should be brought to starvation by insects in a summer or two.

That is a debt we owe to the birds which we can never pay. They do more for us than all the washes and sprays we use. They are of more use in an orchard than an army of men. Yet because, when fruit ripens, these little policemen take their small wages, thoughtless and ignorant people destroy them. In the following season they bewail ruined orchards, gardens despoiled and pastures ruined.

Of course, there are other foods than insects for birds. They imitate the mammals in their diet, and are seed-eaters, insect-eaters, flesh-eaters, carrion-eaters, and fish-eaters on the sea and in the rivers. But even so, our food is not enough to feed the birds through the year. The fruits and seeds which ripen for autumn and winter are not ready in the summer, so in the spring our winter migrants fly away north.

When cold and damp kill insects, or send the survivors into their winter sleep, the fruit-eaters and insect-eaters must fly to where they may find other supplies. It always has been so, and so we have the great natural wonder of migration. Winter drives the warmth-loving birds south. Many leave the United States by way of Florida, or through Mexico or across the Gulf of Mexico, to winter in lands to the south.

THE MYSTERY OF A JOURNEY ACROSS THE PATHLESS SEAS

In the spring they return to the places from which they flew, only to go to the tropics again when the summer is over. We are learning more and more of the fascinating subject of bird migration. For example, we know that swallows of England fly with those of France and Spain, to the west of Africa.

How they find their way across pathless seas from continent to continent is one of the mysteries. They are not taught. For thousands of years their ancestors have followed the same track, and the desire to follow in it seems to come naturally to the young birds. They do not wait till food begins to fail. They reach a certain pitch of strength and contentment. Then desire, ambition, a sudden longing, come to them, and sometimes chimes within the brain of the bird. Then fly they must. A bird taken young from the nest and reared in a cage, is tranquil and friendly till summer wanes. Then, though food is abundant, its hour has come. The little creature, knowing not what stirs in its fluttered breast, beats itself raw against the bars of its cage in order to be free and fly to unknown lands.

TWO ARCTIC BIRDS AND THEIR SEARCH FOR A PLACE IN THE SUN

This instinct, and the power out of which it arises, has had the effect of making birds the most widespread of all orders of life. They fringe the ice barrier of the Antarctic with cheerful life, and the Emperor Penguin goes inland and broods through winter in unimaginable cold and darkness, there to rear its chick.

Up to the Arctic the birds have their habitations, and, wonder of wonders, two little specimens, the knot and the Arctic tern, fly almost from end to end of the earth twice a year. They fly from the Arctic to the Antarctic to catch the sun in the south; they fly back from the Antarctic to follow the sun in his northward journey and make their nests during the season in which it thaws the north.

All the intermediate spaces are similarly filled. Frigid, temperate, tropical climates, each has its bounty of birds. The temperate zones in general have the finest singers, but it is in the warmer lands that plumage is most gorgeous.

THE LITTLE CHORISTERS THAT CHARM US WITH THEIR SONG

Birds are great workmen, creatures capable of immense effort and constancy of purpose. They have a high standard of intelligence and enormous powers of multiplication. Sparrows, blackbirds, thrushes, starlings and other birds that come about the house have proved that they have wonderful adaptability. Our own destiny depends on theirs: they are our natural police for guarding crops and orchards, so helping to feed and clothe us. But they have an even higher value. The melody of their voices, the exquisite charm of their form and feathers, and the grace of their movements through the air, are among our chief delights.

THE NEXT STORY OF ANIMAL LIFE IS ON PAGE 2889.

A CHILDREN'S POEM BY THACKERAY

IT is as an author of fiction that we know Thackeray best. He also wrote poetry, chiefly of a lively and humorous kind. No writer has excelled him in the power to invest objects of everyday life with the interest that arises from sentiment and affection. In this poem we have an admirable example. It is touched with true human feeling. The sentiment attaching to an old chair in which we recall the presence of some absent loved one will never go out of fashion. The "rich Latakie" referred to is a kind of tobacco.

THE CANE-BOTTOMED CHAIR

CONTINUED FROM 2644

IN tattered old slippers that toast at the bars,
And a ragged old jacket perfumed with cigars,
Away from the world and its toils and its cares,
I've a snug little kingdom up four pair of stairs.

To mount to this realm is a toil, to be sure,
But the fire there is bright and the air rather pure;
And the view I behold on a sunshiny day
Is grand, through the chimney-pots over the way.

This snug little chamber is crammed in all nooks
With worthless old knicknacks and silly old books,
And foolish old odds and foolish old ends,
Cracked bargains from brokers, cheap keepsakes from friends.

Old armour, prints, pictures, pipes, china (all cracked),
Old rickety tables, and chairs broken-backed;
A twopenny treasury, wondrous to see;
What matter? 'tis pleasant to you, friend, and me.

No better divan need the Sultan require
Than the creaking old sofa that basks by the fire,
And 'tis wonderful, surely, what music you get
From the rickety, ramshackle, wheezy spinet.

That praying-rug came from a Turcoman's camp;
By Tiber once twinkled that brazen old lamp;
A Mameluke fierce yonder dagger has drawn:
'Tis a murderous knife to toast muffins upon.

Long, long, through the hours, and the night, and the chimes,
Here we talk of old books, and old friends, and old times:
As we sit in a fog made of rich Latakie,
This chamber is pleasant to you, friend, and me.

But of all the old sweet treasures that garnish my nest,
There's one that I love and I cherish the best;
For the finest of couches that's padded with hair
I never would change thee, my cane-bottomed chair.

'Tis a bandy-legged, high-shouldered, worm-eaten seat,
With a creaking old back and twisted old feet;
But since the fair morning when Fanny sat there,
I bless thee and love thee, old cane-bottomed chair.

If chairs have but feeling, in holding such charms,
A thrill must have passed through your withered old arms;
I looked, and I longed, and I wished in despair;
I wished myself turned to a cane-bottomed chair.

It was but a moment she sat in this place,
She'd a scarf on her neck, and a smile on her face!
A smile on her face, and a rose in her hair,
And she sat there and bloomed in my cane-bottomed chair.

And so I have valued my chair ever since,
Like the shrine of a saint, or the throne of a prince;
Saint Fanny, my patroness sweet I declare,
The queen of my heart and my cane-bottomed chair.

When the candles burn low, and the company's gone,
In the silence of night as I sit here alone—
I sit here alone, but we yet are a pair—
My Fanny I see in my cane-bottomed chair.

She comes from the past, and revisits my room;
She looks as she then did, all beauty and bloom;
So smiling and tender, so fresh and so fair,
And yonder she sits in my cane-bottomed chair.

SOUND THE LOUD TIMBREL

Thomas Moore, the Irish poet, is the author of this poem. He was born in Dublin in 1779 and died in 1852.

SOUND the loud timbrel o'er Egypt's dark sea!
Jehovah has triumphed—His people are free.
Sing, for the pride of the tyrant is broken,
His chariots, his horsemen, all splendid and brave,
How vain was their boasting! the Lord hath but spoken,
And chariots and horsemen are sunk in the wave.
Sound the loud timbrel o'er Egypt's dark sea!
Jehovah has triumphed—His people are free.

Praise to the Conqueror, praise to the Lord,
His word is our arrow, His breath is our sword!
Who shall return to tell Egypt the story
Of those she sent forth in the hour of her pride?
For the Lord hath looked out from His pillar of glory,
And all her brave thousands are dashed in the tide.
Sound the loud timbrel o'er Egypt's dark sea!
Jehovah has triumphed—His people are free.

THE FULL SEA ROLLS

W. E. Henley's was the restless soul that conceived these striking verses when under the stress of physical pain.

THE full sea rolls and thunders
In glory and in glee,
O bury me not in the senseless earth,
But in the living sea!

Ay, bury me where it surges
A thousand miles from shore,
And in its brotherly unrest
I'll range for evermore.

PIPING DOWN THE VALLEYS WILD

William Blake has a touch of the mystical and imaginative even in his simplest verses. What he means to suggest to us is the inspiration of the true singer of Nature, whose written poems should be as much in tune with Nature herself as the imaginary piper in this poem who turns his hollow reed into a pen to write down forever the songs he has been piping.

PIPING down the valleys wild,
Piping songs of pleasant glee,
On a cloud I saw a child,
And he laughing said to me:

"Pipe a song about a lamb!"
So I piped with merry cheer.
"Piper, pipe that song again";
So I piped: he wept to hear.

"Drop thy pipe, thy happy pipe;
Sing thy songs of happy cheer!"
So I sang the same again,
While he wept with joy to hear.

"Piper, sit thee down and write
In a book that all may read."
So he vanished from my sight;
And I plucked a hollow reed,

And I made a rural pen,
And I stained the water clear,
And I wrote my happy songs
Every child may joy to hear.

BLAKE

Into these eight lines Dr. Edmund Gosse, an excellent poet and wise critic of books, has compressed a splendid tribute to the eccentric painter and poet William Blake.

THEY win who never near the goal;
They run who halt on wounded feet;
Art hath its martyrs like the soul,
Its victors in defeat.

This seer's ambition soared too far;
He sank, on pinions backward blown;
But, though he touched nor sun nor star,
He made a world his own.

BIRDS *

Richard H. Stoddard, a well-known American poet, in these verses gives us a pretty little fancy. It is a happy thought to liken the fleeting visions of the poet's brain to the birds that flit past the open cage. The poet in the following lines has "caged" very daintily one of these fleeting fancies.

BIRDS are singing round my window,
Tunes the sweetest ever heard;
And I hang my cage there daily,
But I never catch a bird.

So with thoughts my brain is peopled,
And they sing all day long;
But they will not fold their pinions
In the little cage of Song!

MASSA'S IN DE COLD, COLD GROUND

Stephen Collins Foster, the author of this familiar poem, wrote many other well-known songs. Among them are: Old Folks at Home, The Suwanee River and My Old Kentucky Home.

ROUND de meadows am a-ringing
De darkeys' mournful song,
While de mocking-bird am singing,
Happy as de day am long.
Where de ivy am a-creeping,
O'er de grassy mound,
Dere old massa am a-sleeping,
Sleeping in de cold, cold ground.

Down in de corn-field,
Hear dat mournful sound:
All de darkeys am a-weeping,—
Massa's in de cold, cold ground.

When de autumn leaves were falling,
When de days were cold,
'Twas hard to hear old massa calling,
Cayse he was so weak and old.
Now de orange tree am blooming
On de sandy shore,
Now de summer days am coming,—
Massa nebber calls no more.

Massa make de darkeys love him,
Cayse he was so kind;
Now dey sadly weep above him,
Mourning cayse he leave dem behind.
I cannot work before to-morrow,
Cayse de tear-drop flow,
I try to drive away my sorrow,
Pickin' on de old banjo.

*From Poems of Richard Henry Stoddard, copyright, by Charles Scribner's Sons.

THE MAN WHO IS TWELVE YEARS OLD

The poet Wordsworth said, "The child is father of the man," and in these lines Maurice Smiley, an American writer, develops a similar thought. He sees in every boy of twelve the man whom the boy will become, and, knowing that all the great men of a later age are now boys, he takes off his hat and salutes the hidden greatness in boys, undeveloped, but always there waiting to be given its opportunity.

THERE'S a man that I know, and he lives near you,
In a town called Everywhere;
You might not think he's a man from his hat
Or the clothes he may chance to wear;
But under the jacket with many a patch
Is a heart more precious than gold—
The heart of a man 'neath the coat of a boy,
A man who is twelve years old.

He only is waiting to wear the crown
That already is made for his brow;
And I pray that his mind will always be clean,
His body as pure as snow;
His heart always fresh and sunny and warm,
And free from life's canker and mould,
And may he be worthy his waiting estate,
This man who is twelve years old.

We never may know what the future will make
Of the boys that we carelessly meet,
For many a statesman is now at school,
And presidents play in the street.
The hand that is busy with playthings now
The reins of power will hold;
So I take off my hat and gladly salute
This man who is twelve years old.

THE SLEEP

This beautiful poem by Elizabeth Barrett Browning has for its inspiration a phrase of the Seventy-seventh Psalm, "He giveth His beloved sleep." It is the sleep which men call death, and to the author it is God's greatest gift.

OF all the thoughts of God that are
Borne inward unto souls afar,
Along the Psalmist's music deep,
Now tell me if that any is
For gift or grace surpassing this—
"He giveth His belovèd sleep"?

What would we give to our belovèd?
The hero's heart to be unmoved,
The poet's star-tuned harp to sweep,
The patriot's voice to teach and rouse,
The monarch's crown to light the brows?—
He giveth His belovèd sleep.

. . . . . .

"Sleep soft, belovèd!" we sometimes say,
Who have no tune to charm away
Sad dreams that through the eyelids creep:
But never doleful dream again
Shall break the happy slumber when
He giveth His belovèd sleep.

O earth, so full of dreary noises!
O men, with wailing in your voices!
O delvèd gold, the wailers heap!
O strife, O curse, that o'er it fall!
God strikes a silence through you all,
And giveth His belovèd sleep.

His dews drop mutely on the hill,
His cloud above it saileth still,
Though on its slope men sow and reap:
More softly than the dew is shed,
Or cloud is floated overhead,
He giveth His belovèd sleep.

Ay, men may wonder while they scan
A living, thinking, feeling man
Confirmed in such a rest to keep;
But angels say, and through the word
I think their happy smile is *heard*—
"He giveth His belovèd sleep."

For me, my heart that erst did go
Most like a tired child at a show,
That sees through years the mummers leap,
Would now its wearied vision close,
Would childlike on His love repose
Who giveth His belovèd sleep!

And friends, dear friends, when it shall be
That this low breath is gone from me,
And round my bier ye come to weep,
Let One, most loving of you all,
Say, "Not a tear must o'er her fall!
He giveth His belovèd sleep."

FOUR THINGS

A long sermon is condensed into six lines by Henry van Dyke, the well-known American preacher and poet.

FOUR things a man must learn to do
If he would make his record true:
To think without confusion clearly;
To love his fellow-men sincerely;
To act from honest motives purely;
To trust in God and heaven securely.

MARCO BOZZARIS

Marco Bozzaris was a Greek patriot who for a number of years fought against the Turks for the freedom of his country. From the middle of the fifteenth till early in the nineteenth century Greece was under Turkish rule. Marco was killed in an attack upon the Turkish army. This beautiful little poem was written by Fitz-Greene Halleck, an American poet.

AT midnight, in his guarded tent,
The Turk was dreaming of the hour
When Greece, her knee in suppliance bent,
Should tremble at his power:
In dreams, through camp and court he bore
The trophies of a conqueror;
In dreams his song of triumph heard;
Then wore his monarch's signet ring:
Then pressed that monarch's throne—a king;
As wild his thoughts, and gay of wing,
As Eden's garden bird.

At midnight, in the forest shades,
Bozzaris ranged his Suliote band,
True as the steel of their tried blades,
Heroes in heart and hand.
There had the Persian's thousands stood,
There had the glad earth drunk their blood
On old Platæa's day;
And now there breathed that haunted air
The sons of sires who conquered there,
With arm to strike, and soul to dare,
As quick, as far as they.

An hour passed on—the Turk awoke;
That bright dream was his last;
He woke—to hear his sentries shriek,
"To arms! they come! the Greek! the Greek!"

He woke—to die midst flame, and smoke,
And shout, and groan, and sabre-stroke,
And death-shots falling thick and fast
As lightnings from the mountain-cloud;
And heard, with voice as trumpet loud,
Bozzaris cheer his band:
"Strike—till the last armed foe expires;
Strike—for your altars and your fires;
Strike—for the green graves of your sires;
God—and your native land!"

They fought—like brave men, long and well;
They piled that ground with Moslem slain,
They conquered—but Bozzaris fell,
Bleeding at every vein.
His few surviving comrades saw
His smile when rang their proud hurrah,
And the red field was won;
Then saw in death his eyelids close
Calmly, as to a night's repose,
Like flowers at set of sun.

. . . . . .

Bozzaris! with the storied brave
Greece nurtured in her glory's time,
Rest thee—there is no prouder grave,
Even in her own proud clime.

. . . . . .

Talk of thy doom without a sigh:
For thou art Freedom's now, and Fame's:
One of the few, the immortal names,
That were not born to die.

THE EVE OF WATERLOO

This poem was written to commemorate the battle of Waterloo, which was fought in the year 1815. Napoleon was marching upon the city, and Lord Byron here brings vividly before us how the brilliant military ball in Brussels was broken up by tidings of his advance.

THERE was a sound of revelry by night,
And Belgium's capital had gathered then
Her Beauty and her Chivalry, and bright
The lamps shone o'er fair women and brave men;
A thousand hearts beat happily; and when
Music arose with its voluptuous swell,
Soft eyes looked love to eyes which spake again,
And all went merry as a marriage bell;—
But hush! hark! a deep sound strikes like a rising knell!

Did ye not hear it?—No; 'twas but the wind,
Or the car rattling o'er the stony street;
On with the dance! let joy be unconfined;
No sleep till morn, when Youth and Pleasure meet
To chase the glowing Hours with flying feet—
But hark!—that heavy sound breaks in once more,
As if the clouds its echo would repeat;
And nearer, clearer, deadlier than before!
Arm! Arm! it is—it is—the cannon's opening roar!

Within a windowed niche of that high hall
Sate Brunswick's fated chieftain; he did hear
That sound the first amidst the festival,
And caught its tone with Death's prophetic ear;
And when they smiled because he deemed it near,
His heart more truly knew that peal too well
Which stretched his father on a bloody bier,
And roused the vengeance blood alone could quell:
He rush'd into the field, and, foremost fighting, fell.

Ah! then and there was hurrying to and fro,
And gathering tears, and tremblings of distress,
And cheeks all pale, which but an hour ago
Blushed at the praise of their own loveliness;
And there were sudden partings, such as press
The life from out young hearts, and choking sighs
Which ne'er might be repeated; who could guess
If ever more should meet those mutual eyes,
Since upon night so sweet such awful morn could rise!

And there was mounting in hot haste: the steed,
The mustering squadron, and the clattering car,
Went pouring forward with impetuous speed,
And swiftly forming in the ranks of war;
And the deep thunder peal on peal afar;
And near, the beat of the alarming drum
Roused up the soldier ere the morning star;
While thronged the citizens with terror dumb,
Or whispering, with white lips—"The foe! they come! they come!"

And wild and high the "Cameron's gathering" rose!
The war-note of Lochiel, which Albyn's hills
Have heard, and heard, too, have her Saxon foes:—
How in the noon of night that pibroch thrills,
Savage and shrill! But with the breath which fills
Their mountain-pipe, so fill the mountaineers
With their fierce native daring which instils
The stirring memory of a thousand years,
And Evan's, Donald's fame rings in each clansman's ears!

And Ardennes waves above them her green leaves,
Dewy with Nature's tear-drops as they pass,
Grieving, if aught inanimate e'er grieves,
Over the unreturning brave,—alas!
Ere evening to be trodden like the grass
Which now beneath them, but above shall grow
In its next verdure, when this fiery mass
Of living valour, rolling on the foe
And burning with high hope, shall moulder cold and low.

Last noon beheld them full of lusty life,
Last eve in Beauty's circle proudly gay,
The midnight brought the signal-sound of strife,
The morn, the marshalling in arms,—the day,
Battle's magnificently stern array!

The thunder-clouds close o'er it, which when rent
The earth is covered thick with other clay,
Which her own clay shall cover, heaped and pent,
Rider and horse,—friend, foe,—in one red burial blent!

THE BIVOUAC OF THE DEAD

This poem, by Theodore O'Hara, was written in memory of the Kentucky soldiers who were killed in the Mexican War. Part of it is inscribed on a monument in the burying grounds wherever the soldiers of the United States lie at rest.

THE muffled drum's sad roll has beat
The soldier's last tattoo;
No more on Life's parade shall meet
That brave and fallen few.
On Fate's eternal camping-ground
Their silent tents are spread,
And Glory guards, with solemn round,
The bivouac of the dead.

No rumor of the foe's advance
Now swells upon the wind;
No troubled thought at midnight haunts
Of loved ones left behind;
No vision of the morrow's strife
The warrior's dream alarms;
No braying horn, no screaming fife
At dawn shall call to arms.

. . . . . .

The neighing troop, the flashing blade,
The bugle's stirring blast,
The charge, the dreadful cannonade,
The din and shout, are past;
Now war's wild note, nor glory's peal,
Shall thrill with fierce delight
Those breasts that never more may feel
The rapture of the fight.

Like the fierce northern hurricane
That sweeps his great plateau,
Flushed with the triumph yet to gain,
Came down the serried foe.
Who heard the thunder of the fray
Break o'er the field beneath,
Knew well the watchword of that day
Was "Victory or Death."

Long had the doubtful conflict raged
O'er all that stricken plain,
For never fiercer fight had waged
The vengeful blood of Spain;
And still the storm of battle blew,
Still swelled the gory tide;
Not long, our stout old chieftain knew,
Such odds his strength could bide.

'Twas in that hour his stern command
Called to a martyr's grave
The flower of his beloved land
The nation's flag to save.
By rivers of their fathers' gore
His first-born laurels grew,
And well he deemed the sons would pour
Their lives for glory too.

. . . . . .

Sons of the Dark and Bloody Ground,
Ye must not slumber there,
Where stranger steps and tongues resound
Along the heedless air.
Your own proud land's heroic soil
Shall be your fitter grave;
She claims from war his richest spoil—
The ashes of her brave.

. . . . . .

Rest on, embalmed and sainted dead!
Dear as the blood ye gave;
No impious footstep here shall tread
The herbage of your grave;
Nor shall your glory be forgot
While Fame her record keeps,
Or Honor points the hallowed spot
Where Valor proudly sleeps.

Yon marble minstrel's voiceless stone
In deathless song shall tell,
When many a vanished age hath flown,
The story how ye fell;
Nor wreck, nor change, nor winter's blight,
Nor Time's remorseless doom,
Shall dim one ray of glory's light
That gilds your deathless tomb.

THE GREAT ADVENTURER

The author of this song is not known. It was written in the seventeenth century by an English poet who probably belonged to the so-called Cavalier Poets, noted for the melody of their verse and their sprightly fancy.

OVER the mountains
And over the waves,
Under the fountains
And under the graves,
Under floods that are deepest,
Which Neptune obey,
Over rocks that are steepest
Love will find out the way.

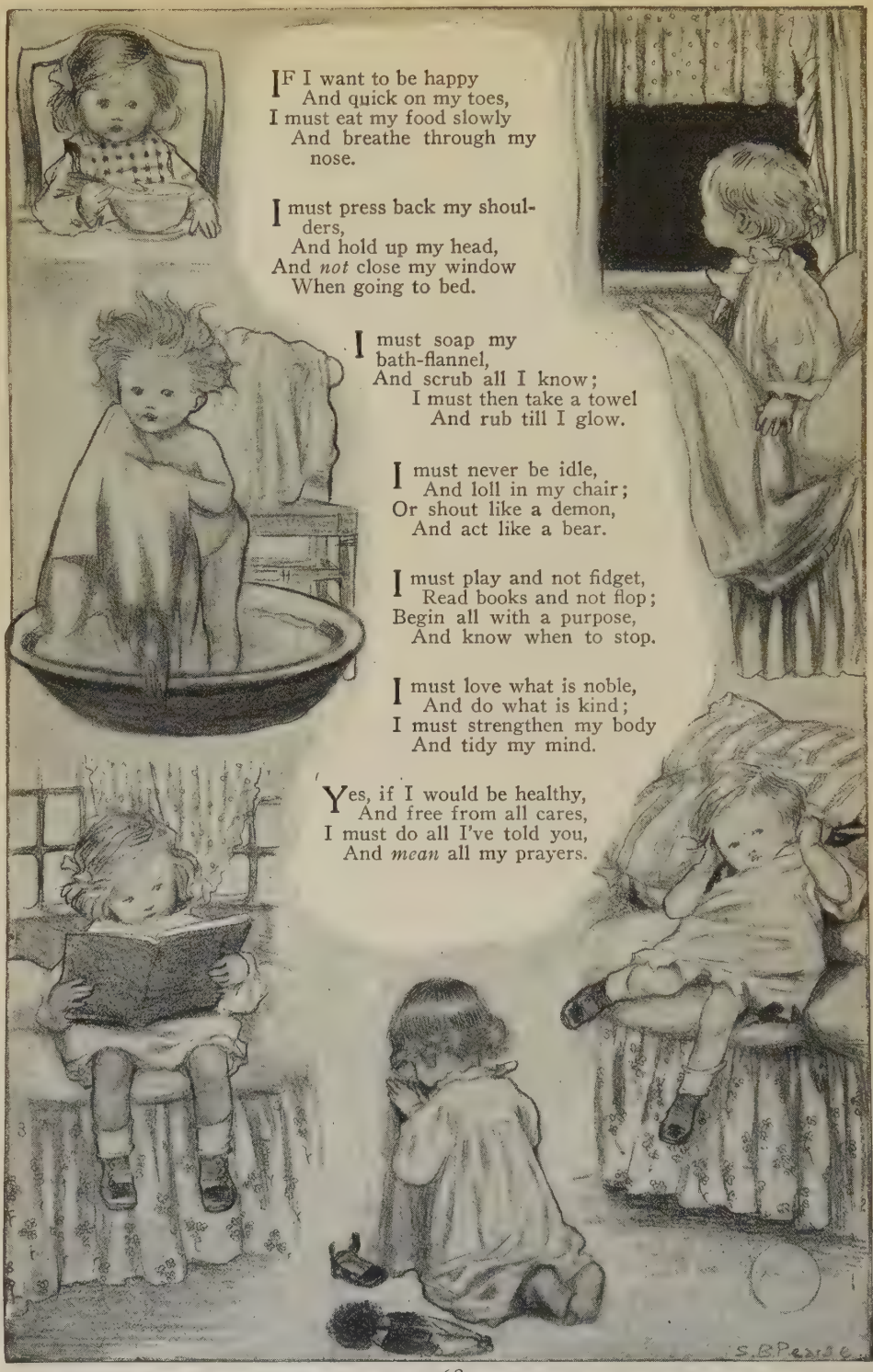
Where there is no place
For the glow-worm to lie,
Where there is no space
For receipt of a fly;
Where the midge dares not venture,
Lest herself fast she lay;
If Love come, he will enter,
And find out the way.

You may esteem him
A child for his might,
Or you may deem him
A coward from his flight:
But if she whom Love doth honor
Be concealed from the day,
Set a thousand guards upon her,
Love will find out the way.

Some think to lose him,
By having him confined,
And some do suppose him,
Poor thing, to be blind;
But if ne'er so close ye wall him,
Do the best that you may,
Blind Love, if ye so call him,
Will find out the way.

You may train the eagle
To stoop to your fist,
Or you may inveigle
The phœnix of the east;
The lioness, ye may move her
To give over her prey;
But you'll ne'er stop a lover—
He will find out the way.

WHAT EVERY WISE CHILD SHOULD KNOW



IF I want to be happy
And quick on my toes,
I must eat my food slowly
And breathe through my nose.

I must press back my shoulders,
And hold up my head,
And *not* close my window
When going to bed.

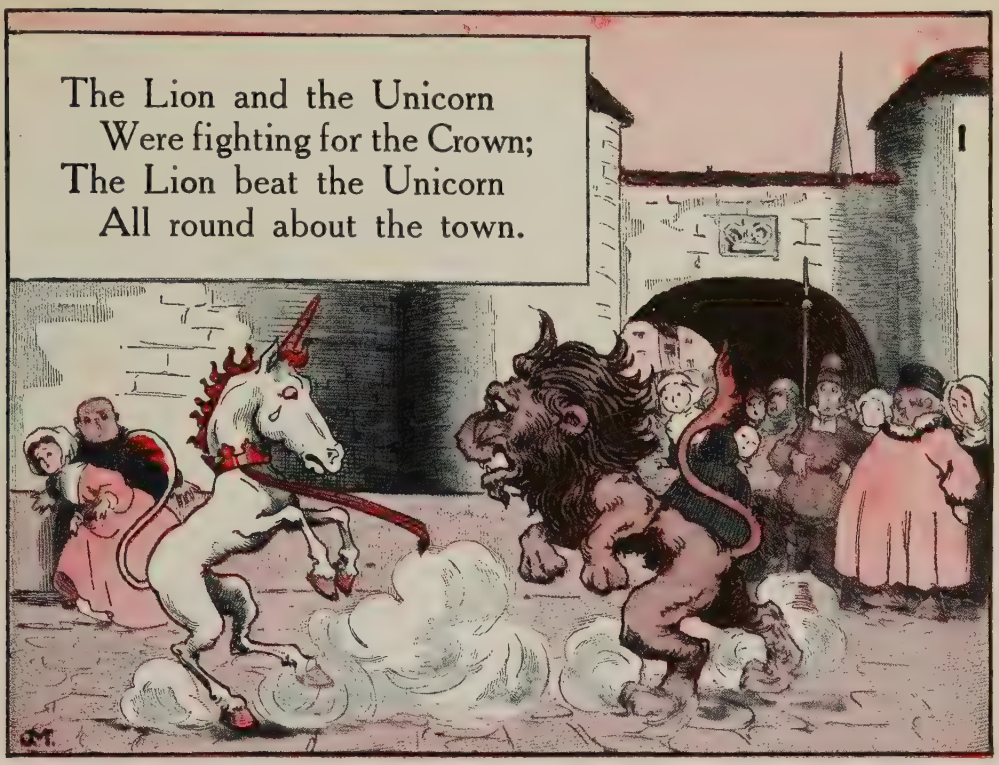
I must soap my bath-flannel,
And scrub all I know;
I must then take a towel
And rub till I glow.

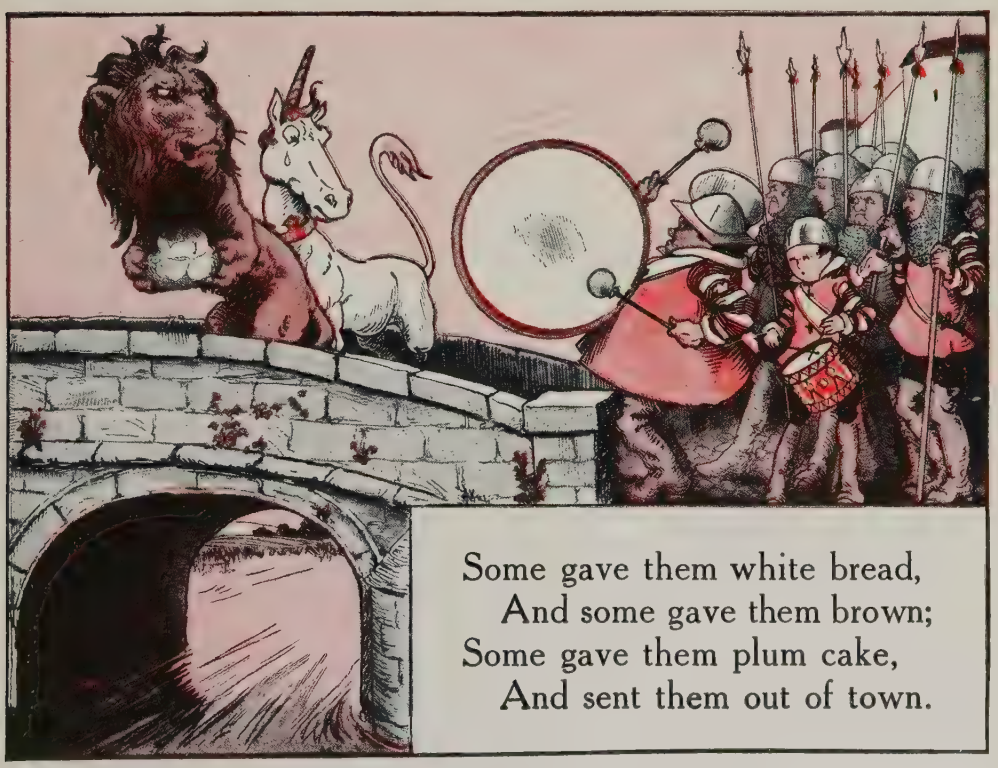
I must never be idle,
And loll in my chair;
Or shout like a demon,
And act like a bear.

I must play and not fidget,
Read books and not flop;
Begin all with a purpose,
And know when to stop.

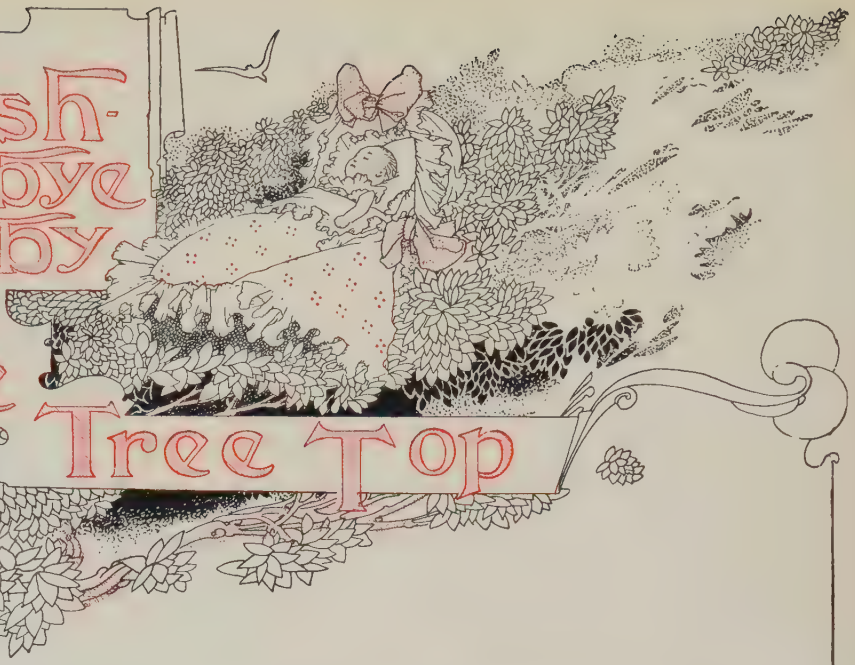
I must love what is noble,
And do what is kind;
I must strengthen my body
And tidy my mind.

Yes, if I would be healthy,
And free from all cares,
I must do all I've told you,
And *mean* all my prayers.


The Lion and the Unicorn
Were fighting for the Crown;
The Lion beat the Unicorn
All round about the town.


Some gave them white bread,
And some gave them brown;
Some gave them plum cake,
And sent them out of town.

Hush-a-bye Baby on the Tree Top



Very Soft.

Hush-a-bye, ba - by, on the tree - top, When the wind

blows the cra - dle will rock; When the bough breaks the

cra - dle will fall: Down will come ba - by, cra - dle, and all!

WHEN GOOD KING ARTHUR RULED THIS LAND

WHEN good King Arthur ruled this land
He was a goodly king:
He stole three pecks of barley meal,
To make a bag pudding.

A rare pudding the King did make,
And stuffed it well with plums;
And in it put such lumps of fat,
As big as my two thumbs.

The King and Queen did eat thereof,
And noblemen beside,
And what they could not eat that night,
The Queen next morning fried.

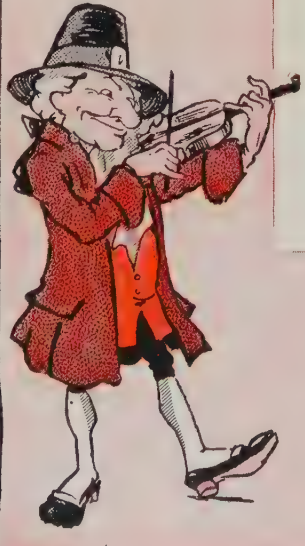
COCK A DOODLE DOO!
MY DAME HAS LOST HER SHOE

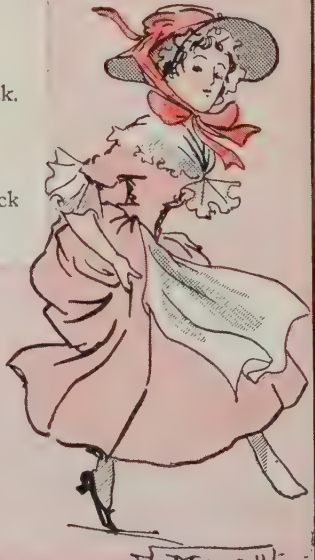
COCK a doodle doo!
My dame has lost her shoe;
My master's lost his fiddling-stick,
And don't know what to do.

Cock a doodle doo!
What is my dame to do?
Till master finds his fiddling-stick,
She'll dance without her shoe.

Cock a doodle doo!
My dame has lost her shoe,
And master's found his fiddling-stick.
Sing doodle doodle doo!

Cock a doodle doo!
My dame will dance with you,
While master fiddles his fiddling-stick
For dame and doodle doo.





THE STORIES OF CHARLES DICKENS

THE novel of Charles Dickens which we are to read here is known to have been his own favorite, for he tells us so in the preface to it. It is also, in some details, true to his own life. If we have read his life in the Book of Literature, page 2731, we can see where David's story resembles the biography. David Copperfield is written in the first person. But there are so many things to tell in it, and so little space to say them in here, that we have told the story in the third person. Although the book is a very long one, this short summary gives its leading features. Our illustrations are from copies of the original pictures drawn for the story more than fifty years ago.

DAVID COPPERFIELD

CONTINUED FROM 2408

THE hero of this story was born, after his father's death, in a quaint old house, called the Rookery, at the village of Blunderstone, in Suffolk. Mrs. Copperfield, since she had become the mother of David, seemed to have nothing in the world to live for but the care of her infant child.

Nor did she receive any help in her time of trouble except from her rosy-cheeked, warm-hearted servant-maid, Clara Peggotty, who loved the gentle woman and her child. David's aunt, Miss Betsy Trotwood, the sister of his late father, might have made matters much better for his mother. But she was a strange woman. Calling at the Rookery the very night that David was born, she was so disappointed to find that the child was a boy and not a girl that she went away and never saw David's mother again.

David's early days were pleasant enough. When he was about nine years old he went with his nurse Peggotty to her brother's home at Yarmouth. What happened there we give in David's words.

THE VISIT TO THE ARK AT YARMOUTH

IT touches me nearly now, although I tell it lightly, to recollect how eager I was to leave my happy home; to think how little I suspected what I did leave forever.

I am glad to recollect that when the carrier's cart was at the gate, and my mother stood there kissing me, a grateful fondness for her and for the old place I had never turned my back upon before, made me cry. I am glad to know that my mother cried too, and that I felt her heart beat against mine.

I am glad to recollect that when the carrier began to move, my mother ran out at the gate, and called to him to stop, that she might kiss me once more. I am glad to dwell upon the earnestness and love with which she lifted up her face to mine and did so.

As we left her standing in the road, Mr. Murdstone came up to where she was, and seemed to expostulate with her for being so moved. I was looking back, round the awning of the cart, and wondered what business it was of his. Peggotty, who was also looking back on the other side, seemed anything but satisfied, as the face she brought back into the cart denoted.

I sat looking at Peggotty for some time, in a reverie on this supposititious case. Whether if she were employed to lose me like the boy in the fairy tale I should be able to track my way home by the buttons she would shed.

The carrier's horse was the laziest horse in the world, I should hope, and shuffled along with his head down, as if he liked to keep the people waiting to whom the packages were directed. I fancied, indeed, that he sometimes chuckled audibly over this reflection, but the carrier said he was only troubled with a cough.

The carrier had a way of keeping his head down, like his horse, and of drooping sleepily forward as he drove, with one of his arms on each of his knees. I say "drove," but it struck me that the cart would have gone to Yarmouth quite as well without him, for the horse did all that—and as to conversation, he had no idea of it but whistling.

Peggotty had got a basket of refreshments on her knee, which would have lasted us out handsomely if we had been going to London by the same conveyance. We ate a good deal, and slept a good deal. Peggotty always went to sleep with her chin upon the handle of the basket, her hold of which never relaxed; and I could not have believed unless I had heard her do it, that one defenseless woman could have snored so much.

We made so many deviations up and down lanes, and were such a long time delivering a bedstead at a public house, and calling at other places, that I was quite tired, and very glad, when we saw Yarmouth. It looked rather spongy and soppy, I thought, as I carried my eye over the great dull waste that lay across the river, and I could not help wondering, if the world were really as round as my geography-book said, how any part of it came to be so flat. But I reflected that Yarmouth might be situated at one of the poles; which would account for it.

As we drew a little nearer, and saw the whole adjacent prospect lying a straight low line under the sky, I hinted to Peggotty that a mound or so might have improved it, and also that if the land had been a little more separated from the sea, and the town and the tide had not been quite so much mixed up, like toast and water, it would have been nicer. But Peggotty said, with greater emphasis than usual, that we must take things as we found them, and that, for her part, she was proud to call herself a Yarmouth Bloater.

When we got into the street (which was strange enough to me) and smelt the fish, and pitch, and oakum, and tar, and saw the sailors walking about, and the carts jingling up and down over the stones, I felt that I had done so busy a place an injustice, and said as much to Peggotty, who heard my expressions of delight with great complacency, and told me it was well known (I suppose to those who had the good fortune to be born Bloaters) that Yarmouth was, upon the whole, the finest place in the universe.

"Here's my Am!" screamed Peggotty, "growed out of knowledge!"

He was waiting for us, in fact, at the public house, and asked me how I found myself, like an old acquaintance. I did not feel, at first, that I knew him as well as he knew me, because he had never come to our house since the night I was born, and naturally he had the advantage of me. But our intimacy was much advanced by his taking me on his back to carry me home. He was now a huge, strong fellow of six feet high, broad in proportion, and round-shouldered; but with a simpering boy's face, and curly, light hair, that gave him quite a sheepish look. He was dressed in a canvas jacket, and a pair of such very stiff trousers that they would have stood quite as well alone, without any legs in them. And you couldn't so properly have said he wore a hat, as that he was covered in a top, like an old building, with something pitchy.

Ham carrying me on his back and a small box of ours under his arm, and Peggotty carrying another small box of ours, we turned down lanes bestrewn with bits of chips and little hillocks of sand, and went past gasworks, ropewalks, boat-builders' yards, shipwrights' yards, ship-breakers' yards, calkers' yards, riggers' lofts, smiths' forges, and a great litter of such places, until we came out upon the dull waste I had already seen at a distance; when Ham said:

"Yon's our house, Master Davy!"

I looked in all directions, as far as I could stare over the wilderness, and away at the sea, and away at the river, but no house could *I* make out. There was a black barge, or some other kind of superannuated boat, not far off, high and dry on the ground, with an iron funnel sticking out of it for a chimney and smoking very cozily, but nothing else in the way of a habitation that was visible to me.

"That's not it?" said I, "that ship-looking thing?"

"That's it, Master Davy," returned Ham.

If it had been Aladdin's Palace, roc's egg and all, I suppose I could not have been more charmed with the romantic idea of living in it. There was a delightful door cut in the side, and it was roofed in, and there were little windows in it;

but the wonderful charm of it was, that it was a real boat which had no doubt been upon the water hundreds of times, and which had never been intended to be lived in, on dry land. That was the captivation of it to me. If it had ever been meant to be lived in, I might have thought it small, or inconvenient, or lonely, but never having been designed for any such use, it became a perfect abode.

It was beautifully clean inside, and as tidy as possible. There was a table, and a Dutch clock, and a chest of drawers, and on the chest of drawers there was a tea tray with a painting on it of a lady with a parasol, taking a walk with a military-looking child who was trundling a hoop. The tray was kept from tumbling down by a Bible, and the tray, if it had tumbled down, would have smashed a quantity of cups and saucers and a teapot that were grouped around the book. On the walls there were some common colored pictures, framed and glazed, of Scripture subjects, such as I have never seen since in the hands of peddlers, without seeing the whole interior of Peggotty's brother's house again, at one view. Abraham in red going to sacrifice Isaac in blue, and Daniel in yellow cast into a den of green lions, were the most prominent of these. Over the little mantelshelf, was a picture of the Sarah Jane lugger, built at Sunderland, with a real little wooden stern stuck on to it; a work of art, combining composition with carpentry, which I considered to be one of the most enviable possessions that the world could afford. There were some hooks in the beams of the ceiling, the use of which I did not divine then; and some lockers and boxes and conveniences of that sort, which served for seats, and eked out the chairs.

All this I saw in the first glance after I crossed the threshold—childlike, according to my theory—and then Peggotty opened a little door and showed me my bedroom. It was the completest and most desirable bedroom ever seen; in the stern of the vessel; with a little window where the rudder used to go through; a little looking-glass, just the right height for me, nailed against the wall, and framed with oyster shells; a little bed which there was just room enough to get into; and a nosegay of seaweed in a blue mug on the table. The walls were whitewashed as white as milk, and the patchwork counterpane made my eyes quite ache with its brightness. One thing I particularly noticed in this delightful house was the smell of fish; which was so searching that when I took out my pocket handkerchief to wipe my nose, I found it smelt exactly as if it had wrapped up a lobster. On my imparting this discovery in confidence to Peggotty, she informed me that her brother dealt in

STEERFORTH MAKES TROUBLE FOR POOR MR. MELL AT SALEM HOUSE SCHOOL

lobsters, crabs, and crawfish; and I afterward found that a heap of these creatures, in a state of wonderful conglomeration with one another, and never leaving off pinching whatever they laid hold of, were usually to be found in a little wooden outhouse where the pots and kettles were kept.

We were welcomed by a very civil woman in a white apron, whom I had seen courtesying at the door when I was on Ham's back, about a quarter of a mile off. Likewise by a most beautiful little girl (or I thought her so) with a necklace of blue beads on, who wouldn't let me kiss her when I offered to, but ran away and hid herself. By and by, when we had dined in a sumptuous manner off boiled dabs, melted butter, and potatoes, with a chop for me, a hairy man with a very good-natured face came home. As he called Peggotty "Lass," and gave her a hearty smack on the cheek, I had no doubt, from the general propriety of her conduct, that he was her brother, and so he turned out: being presently introduced to me as Mr. Peggotty, the master of the house.

"Glad to see you, sir," said Mr. Peggotty. "You'll find us rough, sir, but you'll find us ready."

I thanked him, and replied that I was sure I should be happy in such a delightful place.

"How's your ma, sir," said Mr. Peggotty. "Did you leave her pretty jolly?"

I gave Mr. Peggotty to understand that she was as jolly as I could wish, and that she desired her compliments—which was a polite fiction on my part.

"I'm much obleeged to her, I'm sure," said Mr. Peggotty. "Well, sir, if you can make out here, for a fortnut, 'long wi' her," nodding at his sister, "and Ham, little Em'ly, we shall be proud of your company."

Having done the honors of his house in this hospitable manner, Mr. Peggotty went out to wash himself in a kettleful of hot water, remarking that "cold would never get *his* muck off." He soon returned, greatly improved in appearance, but so rubicund that I couldn't help thinking his face had this in common with lobsters, crabs and crawfish: that it went into the hot water very black, and came out very red.

After tea, when the door was shut, and all was made snug (the nights being cold and misty now) it seemed to me the most delicious retreat that the imagination of man could conceive. To hear the wind getting out at sea, to know that the fog was creeping over the desolate flat outside, and to look at the fire, and think that there was no house near but this one, and this one a boat, was like enchantment. Little Em'ly had overcome her shyness, and was sitting by my side upon the lowest and least of the lockers, which was just large enough for us two, and just fitted into the chimney corner. Mrs. Peggotty, with the white apron, was knitting on the opposite side of the fire. Peggotty at her needlework was as much at home with Saint Paul's and the bit of wax candle as if she had never known any other roof. Ham, who had been giving me my first lesson in all-fours, was trying to recollect a scheme of telling fortunes with the dirty cards, and printing off fishy impressions of his thumb on all the cards he turned. Mr. Peggotty was smoking his pipe. I felt it was a time for conversation and confidence.

"Mr. Peggotty!" says I.

"Sir," says he.

"Did you give your son the name of Ham, because you lived in a sort of Ark?"

Mr. Peggotty seemed to think it a deep idea, but answered:

"No, sir. I never giv him no name."

"Who gave him that name, then?" said I, putting question number two of the catechism to Mr. Peggotty.

"Why, sir, his father giv it him," said Mr. Peggotty.

"I thought you were his father!"

"My brother Joe was *his* father," said Mr. Peggotty.

"Dead, Mr. Peggotty?" I hinted, after a respectful pause.

"Drowndead," said Mr. Peggotty.

I was very much surprised that Mr. Peggotty was not Ham's father, and began to wonder whether I was mistaken about his relationship to anybody else there. I was so curious to know that I made up my mind to have it out with Mr. Peggotty.

"Little Em'ly," I said, glancing at her. "She is your daughter, isn't she, Mr. Peggotty?"

"No, sir. My brother-in-law, Tom, was *her* father."

I couldn't help it. "Dead, Mr. Peggotty?" I hinted, after another respectful silence.

"Drowndead," said Mr. Peggotty.

I felt the difficulty of resuming the subject, but had not got to the bottom of it yet, and must attain the bottom somehow. So I said:

"Haven't you *any* children, Mr. Peggotty?"

"No, master," he answered, with a short laugh. "I'm a bacheldore."

"A bachelor!" I said, astonished. "Why, who's that, Mr. Peggotty?" pointing to the person in the apron who was knitting.

"That's Missis Gummidge," said Mr. Peggotty.

"Gummidge, Mr. Peggotty?"

But at this point, Peggotty—I mean our own peculiar Peggotty—made such impressive motions to me not to ask any further questions, that I could only sit and look at all the silent company till it was time to go to bed. Then, in the privacy of my own little cabin, she informed me that Ham and Em'ly were an orphan nephew and niece, whom my host had at different times adopted in their childhood when they were left destitute; and that Mrs. Gummidge was the widow of his partner in a boat, who had died very poor. He was but a poor man himself, said Peggotty, but as good as gold and as true as steel—those were her similes. The only subject, she informed me, on which he ever showed a violent temper or swore an oath, was this generosity of his; and if it were ever referred to by any of them, he struck the table a heavy blow with his right hand (had split it on one occasion), and swore a dreadful oath that he would be "gormed" if he didn't cut and run for good if it was ever mentioned again. It appeared, in answer to my inquiries, that nobody had the least idea of the etymology of this terrible passive verb to be gormed; but that they all regarded it as constituting a most solemn imprecation.

I was very sensible of my entertainer's goodness, and listened to the women's going to bed in another little crib like mine at the opposite side of the boat, and to him and Ham hanging up two hammocks for themselves on the hooks I had noticed in the roof, in a very luxurious state of mind, enhanced by my being sleepy. As slumber gradually stole upon me, I heard the wind howling out at sea and coming on across the flat so fiercely that I had a lazy apprehension of the great deep rising in the night. But I bethought myself that I was in a boat, after all, and that a man like Mr. Peggotty was not a bad person to have on board if anything did happen.

Nothing happened, however, worse than morning. Almost as soon as it shone upon the oyster-shell frame of my mirror, I was out of bed, and out with little Em'ly, picking up stones on the beach.

"You're quite a sailor, I suppose?" I said to Em'ly. I don't know that I supposed anything of the kind, but I felt it an act of gallantry to say something; and a shining sail close to us made such a pretty little image of itself, at the moment, in her bright eye, that it came into my head to say this.

"No," replied Em'ly, shaking her head. "I'm afraid of the sea."

"Afraid?" I said, with a becoming air of boldness, and looking very big at the mighty ocean. "*I* aint."

"Ah! but it's cruel," said Em'ly. "I have seen it very cruel to some of our men. I have seen it tear a boat as big as our house all to pieces."

"I hope it wasn't the boat that—"

"That father was drownded in?" said Em'ly. "No. Not that one; I never see that boat."

"Nor him?" I asked her.

Little Em'ly shook her head. "Not to remember!"

Here was a coincidence! I immediately went into an explanation how I had never seen my own father, and how my mother and I had always lived by ourselves in the happiest state imaginable, and lived so then, and always meant to live so; and how my father's grave was in the churchyard near our house, and shaded by a tree, beneath the boughs of which I had walked and heard the birds sing many a pleasant morning. But there were some differences between Em'ly's orphanhood and mine, it appeared. She had lost her mother before her father; and where her father's grave was no one knew, except that it was somewhere in the depths of the sea.

"Besides," said Em'ly, as she looked about for shells and pebbles, "your father was a gentleman and your mother is a lady; and my father was a fisherman, and my mother was a fisherman's daughter, and my Uncle Dan is a fisherman."

"Dan is Mr. Peggotty, is he?" said I.

"Uncle Dan—yonder," answered Em'ly, nodding at the boat-house.

"Yes. I mean him. He must be very good, I should think?"

"Good?" said Em'ly. "If I was ever to be a lady, I'd give him a sky-blue coat with diamond buttons, nankeen trousers, a red velvet waistcoat, a cocked hat, a large gold watch, a silver pipe, and a box of money."

I said I had no doubt that Mr. Peggotty well deserved these treasures. I must acknowledge that I felt it difficult to picture him quite at his ease in the raiment proposed for him by his grateful little niece, and that I was particularly doubtful of the policy of the cocked hat; but I kept these sentiments to myself.

Little Em'ly had stopped and looked up at the sky in her enumeration of these articles, as if they were a glorious vision. We went on again, picking up shells.

"You would like to be a lady?" I said.

Em'ly looked at me, and laughed, and nodded "yes."

"I should like it very much. We would all be gentlefolks together, then. Me, and uncle, and Ham, and Mrs. Gummidge. We wouldn't mind then when there come stormy weather. Not for our own sakes, I mean. We would for the poor fishermen's, to be sure, and we'd help 'em with money when they come to any hurt."

This seemed to me to be a very satisfactory, and therefore not at all improbable, picture. I expressed my pleasure in the contemplation of it, and little Em'ly was emboldened to say shyly:

Here we see Mr. Peggotty, Ham, Clara Peggotty, Mrs. Gummidge, Little Emily and David Copperfield inside the Ark.

Little Emily on the beach near the Ark.

"Don't you think you are afraid of the sea, now?"

It was quite enough to reassure me, but I have no doubt if I had seen a moderately large wave come tumbling in, I should have taken to my heels, with an awful recollection of her drowned relations. However, I said "No," and I added, "You don't seem to be, either, though you say you are"; for she was walking much too near the brink of a sort of old jetty or wooden causeway we had strolled upon, and I was afraid of her falling over.

"I'm not afraid in this way," said little Em'ly. "But I wake when it blows, and tremble to think of Uncle Dan and Ham, and believe I hear 'em crying out for help. That's why I should like so much to be a lady. But I'm not afraid in this way. Not a bit. Look here!"

She started from my side, and ran along a jagged timber which protruded from the place we stood upon, and overhung the deep water at some height, without the least defense. The incident is so impressed upon my remembrance that if I were a draughtsman I could draw its form here, I dare say, accurately as it was that day, and little Em'ly springing forward to her destruction (as it appeared to me), with a look that I have never forgotten, directed out to sea.

David surprises his Aunt Betsy.

The light, bold, fluttering little figure turned and came back safe to me, and I soon laughed at my fears, and at the cry I had uttered; fruitlessly, in any case, for there was no one near. But there have been times since, in my manhood, many times there have been, when I have thought, Is it possible, among the possibilities of hidden things, that in the sudden rashness of the child, and her wild look so far off, there was any merciful attraction of her into danger, any tempting her toward him permitted on the part of her dead father, that her life might have a chance of ending, that day?

. . . . . .

So we close David's first impression of Yarmouth. He returned home to find his mother married again. Edward Murdstone, who became David's stepfather, was a cruel man. He hated the small boy and punished him harshly for imaginary offenses. Finally David bit Mr. Murdstone's hand when that hard man was brutally thrashing him.

The result of this conduct was that David, now about nine years of age, was packed off by the stage-coach, with a little box of clothing, all the way to London. There, at Salem House School, Blackheath, Mr. Murdstone had arranged for the boy to become a boarder, under the notorious Mr. Creakle, a master whose one idea of education was to thrash the boys daily. One of the tutors, poor-spirited but kindly Mr. Mell, met David at Whitechapel, and took him to Salem House.

It was holiday time when David arrived. The school was a dreary place. At Mr. Murdstone's orders David was condemned to wear on his back a sign with the words: "Take care of him. He bites."

Here was, indeed, a terrible beginning to David's schooldays—for he was a sensitive boy, and no punishment could have equaled in its brutal effect this arranged by Mr. Murdstone. But handsome James Steerforth, the head-boy of the school, speedily made a friend of David.

Steerforth certainly made the little fellow's life pleasanter than it could otherwise have been. David Copperfield conceived a great admiration for him, which Steerforth seemed to return in some degree of affection for his little friend. They read stories together, and really made the best of a very uncomfortable and ill-kept school.

DAVID SEES HIS MOTHER ONCE AGAIN BEFORE HER DEATH

At the end of six months David was allowed to go home for the holidays, and, to his surprise, he found his mother nursing a baby sister, who had arrived while he was at Salem House. His mother made every effort to appear happy, but even the boy could see she was not. He was glad to return at the end of his unhappy holidays. He had been back at school only two months when his mother and her baby died. David had to make

David has gone with Uriah Heep to take tea with him and his mother in their "'umble" abode, when Mr. Micawber pops in.

the long journey by coach to Blunderstone to be present at her funeral. The one comfort in all his sorrow was faithful Peggotty, who hated the Murdstones as much as she had loved David and his mother.

Of course, Peggotty got notice to quit the Rookery as soon as David's mother was buried. Mr. Murdstone and his sister had allowed her to remain only because her late mistress had had no other servant all her married life. The Murdstones cared so little for David, however, that they had no objection to Peggotty's taking him with her for a time to the home of her brother on the beach near Yarmouth.

When Clara Peggotty brought David here among these simple good people, he was as happy as he could be, and he clung to them all as his only friends, now that his mother was dead. With Emily he attended the very quiet wedding of Clara and Mr. Barkis, the carrier, which took place during his stay at the Ark.

Work in London and a meeting with Mr. Micawber

Murdstone's main desire was now to be rid of his stepson. When David returned to Blunderstone, he found that arrangements had been made for him to be employed in the warehouse of the London wine-merchants in which Mr. Murdstone had some interest. His wages would be enough, he was told, to buy his food and clothing. His lodgings and washing would be paid for by his stepfather. So off the boy was packed to London to make his fortune.

The rat-infested warehouse of Murdstone and Grinby's was on the Thames at Blackfriars, and the work which David was given was of the most menial kind. He was sent to lodge with a Mr. Micawber, then living off the City Road. Thus began an acquaintance that was fated to last for many years.

Mr. Micawber was put in prison for debt, but David was faithful to him. When Mrs. Micawber and her family also removed into the prison—as they could do in those days—a room near to it was hired for their young lodger. David had so great a liking for Micawber that he had no wish to be separated from that good-natured, genial, but hopelessly impracticable person. In the course of time Micawber was liberated again, and with his family set off for Plymouth.

How David ran away from London and found his aunt Betsy

David parted from them with sorrow, and soon after decided to run away from the hateful bottling warehouse. He wrote to Mrs. Barkis to lend him half a guinea, and to tell him if she knew where his aunt, Betsy Trotwood, lived. His dear old nurse sent him the money, but could only say that his aunt lived somewhere near Dover or Folkstone way. Even with so vague a destination, David set out, but had not got clear of London before he was robbed of his box and his money. He had to suffer terribly before he found himself in dirty rags at the door of his aunt's comfortable little house at Dover. The lady was amazed to see the ragged boy, who told her she was his aunt and that his name was David Copperfield.

But a new and happy chapter in David's life began. Instead of being the sour old woman we might have expected from her conduct the night David was born, she proved the kindest and best of aunts. She forgave David for being a boy, and made him call himself Trotwood Copperfield in future.

Miss Trotwood at length decided to send him to Dr. Strong's academy at Canterbury. She made arrangements for him to board at the house of her lawyer there, Mr. Wickfield, whose young daughter Agnes looked after the house, Mrs. Wickfield being dead.

David was extremely happy here, both at school and at home, and came to regard Agnes as his chum, to whom he could tell his inmost thoughts. The only person he did not like was Mr. Wickfield's clerk, a young man named Uriah Heep. This creature forced his acquaintance on David, and always pretended to be very humble.

David's aunt chooses a profession for him and fits him out

The happy days at Canterbury came to an end, and David's aunt furnished him with money to take him to London. She paid a thousand pounds to the firm of Spenlow and Jorkins to get him taken as a pupil in a branch of the law which related chiefly to church matters and marriages.

All his rent and spending money was provided by Miss Trotwood, so David had little to worry about. But he was lonely and not very happy.

In his profession he made no great progress. But Mr. Spenlow invited him to his house, and he was at once over head and ears in love with Miss Dora, his employer's motherless daughter, a fragile but bright and lively girl, who also fell in love with him.

When all seemed brightest for our hero, trouble was brewing in many different ways. Uriah Heep got Mr. Wickfield under his thumb, and managed to implicate him in some swindling transactions. Little Emily was to be married to honest Ham, but she ran away with Steerforth, and gloom and mourning descended among the simple folk at Yarmouth. David aspired to marry Dora Spenlow, but suddenly he received information from his aunt that she had lost all her fortune except the house at Dover. This she had let, and was coming to take up her abode with him in London. David saw his hope of success as a proctor vanishing, for he could no longer think of going on without earning some money to help his aunt. He became secretary to his old schoolmaster, Dr. Strong, now in London and engaged in compiling a dictionary. He also learned shorthand and became a reporter. Mr. Micawber turned up about this time with great prospects.

David Copperfield at Mr. Micawber's party.

He was going to be clerk to Uriah Heep at Canterbury. The villain was now the real head of Mr. Wickfield's business, and, with his "'umble" mother, lived in the house, to the distress of poor Agnes.

DAVID MARRIES DORA AND BEGINS TO WIN FAME AS AN AUTHOR

David was still deeply in love with Miss Dora. As he was now earning quite a good income by writing, and beginning to win fame as an author, he ventured to propose to the aunts with whom she had gone to live that Dora and he should marry. Before long the aunts gave their consent, and they were married. Dora was still little more than a girl, and she was quite unable to keep house properly. Indeed, she was everything that was charming, except a housewife. David's home was always in a muddle; while poor Dora played with her little dog Jip. He had the most lovable of wives all the same, and his only sorrow was to notice that her health seemed to grow feeble, the brightness of her eyes to fade, as the months wore on.

Meanwhile things were going badly with Mr. Wickfield. Agnes was in great distress when one day the worthy Micawber called, in a very troubled state of mind, to see David and his aunt. He had discovered the swindling of Uriah Heep, and had set himself to bring honest people to their own. Thanks to him, Miss Trotwood's lost fortune was largely recovered and Mr. Wickfield was restored to happiness and content.

Miss Trotwood, out of gratitude for Micawber's service, advanced the money for him and his family to go out and establish themselves in Australia. In the same boat sailed Mr. Peggotty and Mrs. Gummidge. With them went Emily, whom her uncle still cherished, though she had run away from home and he had had to search for her far and wide.

David saw them all sail away, and the night fell darkly on the waters and on him. He next went down to Yarmouth with a letter for Ham. But he arrived there to see the honest young man drowned in trying to reach a wreck, on which the last man who was washed away was the false friend Steerforth. The shadows were gathering round his own hearth, too, for poor Dora gradually faded away. One day she died peacefully in the arms of Agnes Wickfield.

David Copperfield, who had known all these sorrows, was still a very young man, with all his life's work before him and his fame as an author steadily growing. He traveled abroad for some years, then returned to marry Agnes Wickfield.

THE NEXT STORY OF FAMOUS BOOKS IS ON PAGE 3141.

PICKING COTTON IN THE SOUTH

Cotton is the most important of textile fibres and the United States is the largest producer. Cotton is picked by hand because machinery, though it has been tried, cannot select the ripe bolls, which do not all open at the same time. This is a typical scene in the southern states.

Cotton-picking on a flourishing plantation in the Sudan.

PLANTS THAT CLOTHE US

CONTINUED FROM 2624

CHIEF among the plants that furnish us with clothing is Cotton, and it is not without reason that Americans say "Cotton is king." The world cannot get enough cotton for its needs, and not only are these needs constantly growing, but fresh uses are being found for the fibre, so that the supply always lags behind the demand; and on top of the general shortage comes an insect pest which has for years cut off a great part of the world's supply.

Not only is the cotton-fibre used as cotton, but, prepared in different ways, it is made into a substitute for silk, wool and linen. For the first of these it goes through a process known as mercerization; for the second it is fluffed up after weaving, and cotton damask is sold for tablecloths.

Cotton was in general use in India at least fifteen hundred years before the time of Jesus. Alexander the Great introduced the plant into Europe, and soon came the story of the "vegetable lamb of Tartary." A plant was supposed to bear little woolly lambs, from which the fibre was cut. Columbus, in 1492, found the people of the West Indies using cotton, and both there and on the continent they had great skill in working the fibre into garments. No one can say where cotton began.

The plant, like the hollyhock, is a member of the Mallow Family. Many varieties are grown, but the most valuable is Barbados cotton, cultivated in America and carried to other countries. Sea Island cotton, grown in the West Indies and in Florida, Georgia and South Carolina, yields the strongest, longest and finest fibre. It is a variety of Barbados cotton, and a single pound of this fibre can be spun into a thread over two hundred miles long. The ordinary cotton grown in the United States has a shorter, thicker fibre.

Some cotton plants are herbaceous annuals, others are shrubs that grow three or four feet high, and others reach the size of small trees, fifteen or twenty feet high. The stems are sometimes smooth and sometimes hairy; the leaves are three- or five-lobed and pointed; and the blossom is large, with white or creamy petals and a reddish or purple centre. That is the condition when it opens. On the second day it becomes pink or reddish, and on the third day it falls. The flower is succeeded by a pod which on ripening bursts open and displays a quantity of down. This is the cotton of commerce. It grows on the surface of the dark brown or black seeds, which vary in number from ten to thirty.

They are crushed in order that the oil may be extracted. The oil is wholesome, and much of it is used for food purposes. The cake, after the oil is extracted, is fed to cattle or used in the manufacture of fertilizer. At one time an American grower was only too glad to allow anyone to have the seeds for the trouble of carrying them away, but now they provide a large part of his income from the crop.

It is for the fibre, however, that the plant is chiefly grown. The Cotton Belt is the area lying between the 36th parallels of latitude north and south of the Equator, and within this area cotton can be grown. For many years after the invention of the cotton-gin the United States and the West Indies furnished the greatest part of the cotton produced, but efforts have been constantly made to increase production elsewhere. Now considerable quantities of cotton are grown in India, Egypt and other parts of Africa, Turkestan, Australia, South and Central America, and Mexico, but until recently the United States has furnished about three-fourths of all produced in the world.

The plant, however, needs a special soil and climate. There must be six months of growing weather—warm, with showers and plenty of sunshine. When the danger of a frost is past, the farmer sows the seed in rows like peas. The plants come up, and soon the strongest assert themselves, while the less vigorous plants are hoed out with the weeds. A cultivator is then driven between the rows to stir the surface of the soil and remove young weeds, and this has to be repeated every week or ten days. The cotton plant is able to resist drought better than many other crops, the reason being that it has a tap root penetrating to a great depth, and so is able to draw upon water supplies that are beyond the reach of many other plants.

THE LITTLE INSECT THAT IS CHANGING THE FACE OF THE COTTON WORLD

With good rains at night and hot sunshine by day the plants grow rapidly, sending out side branches with leaves, and on these branches buds, called "squares," form. These open, and when the petals fall, on the third day, little pointed bolls develop. The boll grows till it becomes about as big as a walnut, and then it cracks along three divisions, exposing the fibre. Now comes the picker and pulls the cotton out of the pod. This is usually done by hand, because the bolls do not all ripen together and so there is little advantage in using a machine. Machines on the principle of the vacuum-cleaner, however, have been invented, and are used on some plantations. The bolls ripen gradually through a period of three months. What happens to the cotton afterward is shown on page 5167.

In recent years a great enemy has appeared in the Cotton Belt of North America. This is the cotton boll-weevil, which first entered the United States from Mexico about 1890 and has now invaded practically the whole of the cotton-growing region. It is a brownish beetle about a quarter of an inch long, and while the males feed on the blossoms and the bolls, the females lay their eggs in the blossoms and the grubs hatch out and feed on the flowers, preventing them from developing. In this way enormous damage is done by the pest, and through it the supremacy of the United States as a cotton-growing country is threatened.

THE TREMENDOUS DAMAGE DONE BY THE WEEVIL

Owing to better methods of cultivation, the quantity produced in the United States is still very large, in spite of insect pests, but instead of furnishing three-fourths or more of the world's supply the southern states now produce only three-fifths or less. Vigorous efforts to check the boll-weevil and other pests are being made, but have not been entirely successful. The damage amounts to hundreds of millions of dollars every year.

THE MANY USES TO WHICH THE FLAX PLANT IS PUT

Before the growing of cotton became general in the United States Flax, from which linen is made, was the world's most important fibre crop. We read of it in the Bible. In the nineteenth century, however, it was fast overtaken by cotton and had to surrender first place to its rival. At one time large quantities were produced in Great Britain, but the quantity is now insignificant, though in Ireland flax is still an important crop. Russia, under normal conditions, grows an enormous amount of flax, and in the years immediately before the Revolution had between four and five million acres under this crop. The finest flax is grown in Belgium.

Where the plant originated no one can now say, for it is not found wild anywhere

THREE PLANTS THAT GIVE US FIBRE

Common Flax.

The Silk-Cotton Tree of Jamaica.

A fine field of Sisal Hemp, or Agave.

to-day except where it has escaped from cultivation. Probably it grew wild in Assyria and the Nile Valley before it came under cultivation. The mummies of the early Egyptian tombs were wrapped in linen made from flax fibre.

But it is not only for its fibre that flax is grown. The seed yields a valuable oil called linseed oil, which is used for many purposes, including the making of paints and the preparation of patent leather, oilcloth and linoleum. After the extraction of the oil the seeds are ground up into meal which is used for making poultices, and also for cattle food. Little flax is grown for the fibre in Canada and the United States, but thousands of acres are planted for the seeds.

Flax is a delicate plant from two to three feet high, with long narrow leaves and pale blue flowers which are succeeded by round, five-chambered capsules, each chamber of which contains two seeds. The best soil for growing flax is heavy, rich, well-drained loam. The seed is sown broadcast, and when the plants are about two inches high they are carefully weeded by women and boys, who kneel to their work. When a fine, silky fibre is required, the plants are harvested by being pulled up soon after the fall of the petals, but when the seeds are required for oil-crushing, the plant is left till stems and petals have both turned yellow. Where seed for sowing is needed, the plant must be left till it is ripe. The fibre is contained in the stems, and the process of making this into linen cloth is shown in the chapter beginning on page 3317.

The valuable evergreen fibre that grows wild in New Zealand

Another valuable fibre plant that goes by the name of flax, though it is really a member of the Lily Family, is New Zealand flax, or Phormium, sometimes called the Flax Lily. It is an evergreen that grows wild in New Zealand, and can be easily cultivated on the poorest soils. It was introduced into Europe more than a century ago as an interesting garden flower and decorative plant for the greenhouse. The leaves are something like those of the iris, being about four or five feet long and an inch or two broad. They are quite picturesque, but the brownish yellow flowers are not very attractive. The plant can be propagated quite easily by the division of its bulbous root.

The leaves yield a very fine and strong fibre which was used by the Maoris for making garments, rope and sailcloth long before Europeans went to the islands. Botanical experts in England in recent years have given much attention to this plant, and by a process of selection they have produced an improved flax lily that gives an excellent imitation of flax, and can be produced more cheaply. The yield per acre is nearly four times that of flax, and with the world's growing need of fibre this plant may become a very important crop in the near future.

The plant that gives the Russian peasant clothes and light

Hemp is a plant cultivated for its fibre in most of the temperate regions of the world. It is a member of the Nettle Family, and its male and female flowers are produced on different plants. But though there is only one species of hemp, this varies very much according to the conditions under which it is grown. It may be a small plant, only three or four feet high, or it may tower up eighteen or twenty feet. The female plants are taller and stronger than the male. The large leaf is divided into from five to seven long lance-shaped leaflets. The fibre is obtained from both the male and female plants, but the male plants yield a finer fibre than the female.

In Europe generally, hemp is used for making cordage and sailcloth, but in Russia the peasants weave shirts and other garments of it. The cloth made from hemp is, of course, stronger than that made from flax, but it is much coarser. The plant is also grown for its seeds, from which an oil is expressed that the Russians use in cooking and for burning in lamps. Hempseed is often given to cage birds for food.

Some plants incorrectly called hemp

Manila hemp, as we read on page 3792, is not really the product of the hemp plant at all, but of a non-edible Banana. Several distinct but closely related species of plants yield the fibre and they are cultivated on hillsides in districts where the air is humid. The drainage must be good, for the plants will not grow, let alone thrive, in water-logged soil.

The Manila hemp plant is propagated by suckers, which take three years to come to maturity. It attains a height of from eight to twenty feet, and the fibre is in the overlapping leaf-sheaths that

FLAX CULTIVATION IN NEW ZEALAND

Carting the leaves of Phormium, or New Zealand Flax, a member of the Lily Family.

A plantation of Phormium.

Gathering the Phormium for the mill.

Drying the Phormium fibre in the sun after it has been washed.

support the stem. The stiff coarse fibre makes the best rope and twine; when the cordage wears out it is pulped and Manila paper is made from it.

Another very useful fibre is Sisal hemp. This, too, comes, not from the hemp plant, but from an Agave, a near relative of the century plant. It is grown on stony and dry soils in Yucatan, Central America, the Bahamas and Queensland, and the plants are propagated by suckers as in the case of Manila hemp. These are set in the rainy season, and the plants require little attention beyond the cleaning-away of weeds once or twice a year. The fibre is obtained from the long sword-shaped leaves armed with prickles along their margins. These leaves are fed into a machine that scrapes out the pulp and washes the fibre; and the fibre is then hung out to dry in the sun for two or three days.

RAMIE, ONE OF THE MOST REMARKABLE OF THE FIBRE PLANTS

Ramie, called also Ramie Hemp and China Grass, is a fibre closely resembling hemp. It is a member of the Nettle Family, and has long been used in India, China, Japan and other Eastern countries for the making of cordage and for the preparation of textiles. It is a perennial shrub, and the fibre is obtained from the bast on the inner side of the bark. Until recent years the fibre was always separated by hand, a costly process, and although the Indian Government offered prizes for the invention of a machine to do this work, no satisfactory apparatus was forthcoming for many years. The problem has now been solved, however, and several kinds of machines are in use.

In some ways ramie is the most remarkable of all the fibre plants, for it combines the qualities of fineness, strength and lustre in a way that no other plant does. Another advantage is that it is more like wool than any other plant-fibre, and can be used as a substitute for wool.

THE PLANTS FROM WHICH JUTE IS OBTAINED

The two plants from which jute is obtained are members of the family to which the basswood tree belongs. They are grown extensively in India, and also in China, Formosa and the Malay States. They are annual plants reaching a height of from five to ten feet. They thrive best in a hot damp climate, and in a highland district. As soon as the plants are in flower the crop is gathered, the whole plant being pulled up by hand or the stems cut with a sickle. The stalks, tied in bundles, are placed in water, and after a time the fibre can be easily separated from the stems.

Jute has been used in India from very remote times, but by Western peoples it has been recognized as a useful textile for less than a century. Its chief use is the making of sacks and baling cloth. Cotton bales are often covered with coarse cloth made of jute.

SEVERAL OTHER PLANTS WHICH FURNISH VALUABLE FIBRES

Coir, or coconut fibre, is obtained from the outer husks of the Coconut, gathered while these are green. If the nuts are allowed to ripen the fibre becomes brittle. It is used largely for making doormats and matting, and in Asia rope also is made from coir. The husks are split open by forcing them against a pointed stick fixed in the ground, and they are then softened by being soaked in water. The next process is to beat them with mallets and rub them between the hands till the fibre is freed from the tissue; it is then dried. In modern factories machinery is used.

Raffia, the long thin strips of tying material used by gardeners, and also for making baskets and hats, is obtained from the leaves of a palm tree that grows abundantly in Madagascar and Brazil. Mauritius hemp is a fibre yielded by the leaves of a plant belonging to the Amaryllis Family, which includes the daffodil and snowdrop. Sunn hemp comes from a member of the Pea Family, a shrub ten or twelve feet high, cultivated in India. The fibre is obtained from the stems.

A plant much used in the making of paper is Esparto Grass, a native of the south of Europe, which from ancient times has been utilized on both sides of the Mediterranean in the manufacture of carpets, rope, baskets and sandals. The grass, which looks very graceful as it grows, is found wild, and will flourish on the poorest rocky soil and in a dry atmosphere. Supplies come chiefly from Spain and North Africa.

AN INTERESTING TREE WITH BARK THAT LOOKS LIKE LACE

Another interesting plant which produces fibre is the Lace-Bark tree of the West Indies. The inner bark of this lofty tree has all the appearance of coarse lace, and a governor of Jamaica presented

GUTTA-PERCHA AND INDIA-RUBBER TREES

A fine Gutta-percha Tree.

An India-rubber Tree growing in Ceylon.

A nursery of India-rubber plants; stumps cut ready for planting out.

Cultivating a rubber plantation on hilly ground in Burma.

Pictures reproduced by courtesy of The Rubber Growers' Association and the West India Committee.

Charles II with frills and ruffles made from it. Whips were formerly made from the threads. The Silk-Cotton tree, also a West Indian plant, has fibrous seed-cases which are used for stuffing cushions.

There is one other class of plants which may be mentioned here as providing a substance used for clothing, although that is not its principal use. Rubber is one of the most important plant products in the world, and if the supply were suddenly cut off, modern civilization would be changed. We tell how rubber is obtained on page 1405.

The Rubber Tree of Brazil, Which Has Gone into Many Lands

In the Amazon basin rubber is obtained from a number of trees belonging to the Spurge Order which grow wild, and one of these, the *Hevea brasiliensis*, has been introduced into other parts of the world, and now produces much rubber in Ceylon and British Malaya. The rubber obtained from this tree is called Para rubber, from a town near one of the mouths of the Amazon from which it is exported.

Another plant that produces rubber is the *Castilloa elastica*, of Central America, a member of the Nettle Family. It is a tree, and has been carried from its native home to other parts of the world. Though in Central America it grows in forests, in other lands it has been found to thrive better in the open. It develops into a tall tree, sometimes 150 feet high, with light gray bark and branches bearing large leaves in rows. As in the case of other rubber-yielding plants, the tree is not fit for tapping for several years.

The Assam rubber tree found in the eastern tropics is the ornamental India-rubber plant often grown as a house plant. In the East it reaches the size of an elm, and the massive roots, spreading all over the ground, give it a very striking appearance. It is a member of the Fig Family, and, like the banyan tree, another member of the same family, it throws down from its branches slender thread-like roots that enter the ground and then grow thick enough to act as supports for the branches as they develop.

Some of the Interesting Relatives of the Periwinkle

Lagos silk rubber is obtained from the *Funtumia elastica*, a tree sixty or seventy feet high, that grows wild only in tropical Africa. It is a relative of our common periwinkle, and each of its white or yellow flowers bears a silky plume about two inches long that is taken by the wind and carried quite long distances in the same way as thistledown is carried. In Africa grow other relatives of the periwinkle which also produce rubber. These are climbers known as *Landolphias*, and in the forests where they are found wild they form dense and tangled masses of rope-like stems that reach the very tops of the tallest trees. The flowers and brightly colored fruits make them very conspicuous.

Some Other Plants Which Produce Rubber

Two other kinds of rubber may be mentioned, both produced in South America. One is Guayule rubber, obtained from a plant called *Parthenium*, which is related to the sunflower. It is neither a tree nor a climber, but a small herbaceous plant, rarely growing more than three feet high and sometimes not exceeding a few inches. It is found in the north of Mexico, and is the only member of the Composite Order, to which the daisy and dandelion belong, that yields rubber.

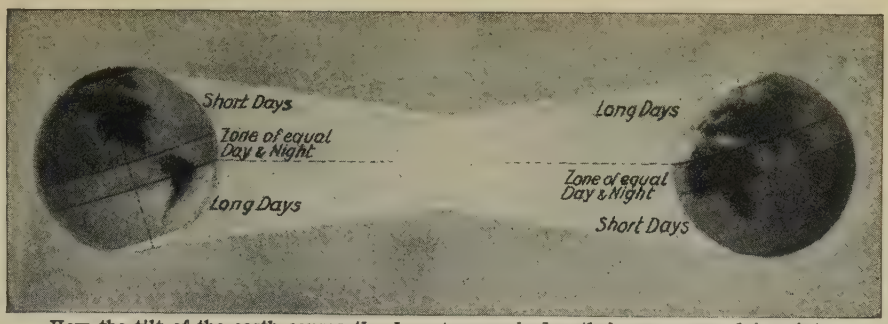
Ceara rubber comes from a tree of the Spurge Order, known as *Manihot glaziovii*, a near relative of the cassava plant, from which we obtain tapioca. It is a native of Brazil, but has been introduced into many other tropical countries such as India and Ceylon, and West, East and South Africa, the West Indies and North Queensland.

This plant often reaches a height of thirty feet in the second year after the seed has been planted, and the tree is very distinctive, having bluish gray leaves and a trunk from which the bark peels in strips like the silver birch of our woods. It grows well on rocky soils in arid districts, and thrives where other rubber plants will not succeed.

The Valuable Substance Used for Insulating Electric Wires

A substance something like rubber is gutta-percha. It is obtained from two closely related trees in the Malay Peninsula, and comes as a milky juice when the tree is tapped. It is not elastic, and has the peculiar property of softening in warm water and then becoming rigid again when it is cold. It is used for insulating electric wires, for handles of surgical instruments, and by dentists for taking impressions. The gutta-percha trees are evergreens.

THE NEXT STORY OF PLANT LIFE IS ON PAGE 2909.



How the tilt of the earth causes the days to vary in length in summer and in winter.

WHY THE SEASONS COME AND GO

CONTINUED FROM 2668

WE have learned that the shape of the earth and the irregular distribution of land and water on its surface, and also the sensitive envelope of gas, work together to produce remarkable differences of climate in different parts of the globe, especially in regard to temperature and rainfall.

In spite of this wonderful variety the underlying causes are very simple. The circumstances that give rise to the seasons are, if anything, still more simple, and their results are even more remarkable.

If the conditions of the earth's climates were invariable, the climate of any individual place would remain the same. Hot places would always be hot, cold places always cold. Some districts would suffer from endless rains, others would never escape from drought.

It is true that there are a few unhappy lands where such monotonous conditions are almost true, but this is only where circumstances are exceptional. In most parts of the globe the conditions vary very much from one time of year to another. This variation in the climate throughout the cycle of the year constitutes what we call the seasons. Let us see what causes this variation.

The first fact we learn about the cause of climate is that its variations are caused primarily by the different angles at which the sun's rays reach the earth. Broadly speaking, the Equator is the region where the sun's rays fall most directly, while toward the Poles they become increasingly oblique. In reality the path of the sun is not always exactly over the earth's Equator. The reason is that the axis on which the earth revolves is not exactly at right angles to the plane in which it moves round the sun.

If we think of the wheel of a bicycle as it is being ridden along a road, we shall see that when the bicycle is upright the axle of the wheel is parallel to the surface of the road. When the bicycle leans over to one side, as it does when rounding a corner, the axle is tilted up. In much the same way the axis of the earth is tilted.

Let us consider what this means. If the axis were not tilted, the only part of the earth which could ever be reached by vertical sunshine would be a zone exactly around the Equator. With a tilted earth we see that when we are on one side of the sun the rays fall directly to the north of the Equator, and when we are on the other side they fall to the south side of the Equator.

At any time during the year the apparent path of the sun is a circle parallel to the Equator. This circle is at its most northerly position on June 22, when it lies about sixteen hundred miles north of the Equator; and at its most southerly position on December

22, when it is an equal distance on the other side. These two dates are known as the solstices, which means that the sun appears to stand still after reaching its extreme position.

Midway between the solstices the path of the sun travels gradually from one extreme to the other, and on two dates, March 22 and September 22, it falls exactly over the Equator itself. These days are known as the equinoxes, because the length of day and night is then exactly equal all over the world.

WHY WE HAVE LONGER DAYS IN SUMMER THAN IN WINTER

One of the most interesting results of the obliquity of the earth's axis is the effect it has on the amount of sunlight in different parts of the globe. In the zone over which the direct rays of the sun pass at all times of the year the day and night are always of the same length. Between March and September, when the northern hemisphere is turned toward the sun, the daylight in that half of the earth is longer than the darkness. The closer we get to the North Pole the greater becomes the length of the day and the shorter the night.

In the neighborhood of New York Midsummer Day has 15 hours and 7 minutes of daylight; Winnipeg has 16 hours and 23 minutes; and London has about 16½ hours of daylight and 7½ hours of darkness. In the Shetland Islands the daylight increases to 18½ hours and only 5½ hours are dark. Beyond the Arctic Circle—that is, within about sixteen hundred miles of the North Pole—the sun at midsummer does not dip below the horizon at all; and near the Pole itself daylight lasts unbroken for six whole months, from the spring equinox in March till the autumnal equinox in September.

THE LONG NIGHT WHICH LASTS FOR SIX MONTHS IN THE POLAR WORLD

During all this time the conditions in the southern hemisphere are exactly the reverse. The night is longer than the day, and grows longer and longer as one approaches the South Pole, where there is a winter of six months of darkness, though there is some moonlight.

In the northern winter, between September and March, everything is the other way round. The northern hemisphere now gets the shorter day and longer night, and the Arctic regions in their turn have to endure six months during which the sun is never seen above the horizon. Meanwhile the southern hemisphere is enjoying the long hours of daylight and the Antarctic is making up for its long, dark winter by six months of daylight.

Now let us examine another way in which the tilted axis of the revolving earth affects the temperature. This is a more complicated problem, because while the length of the day depends absolutely on the distance from the path of the sun—on the angle or slope with which the sun's rays fall—we have already learned that the solar heat is modified in many ways: by the height of the ground above the sea, by the distribution of land and water, and by the movements of the great air currents which we call the planetary winds.

The earth gradually changes its position in regard to the sun throughout the year. The zone of the direct rays changes from its most southerly position to its most northerly and back again. Therefore all the climatic phenomena which depend upon the position of the earth in regard to the sun travel backward and forward with it. The great belts of the trade winds, which always blow toward the zone of greatest heat, shift north and south, and the anti-trades, or Pole-seeking winds, which occupy two great belts between the trade-wind belts and the Poles, are similarly shifted from season to season.

THE TROPICAL ZONES WHERE THE YEAR IS ONE LONG SUMMER

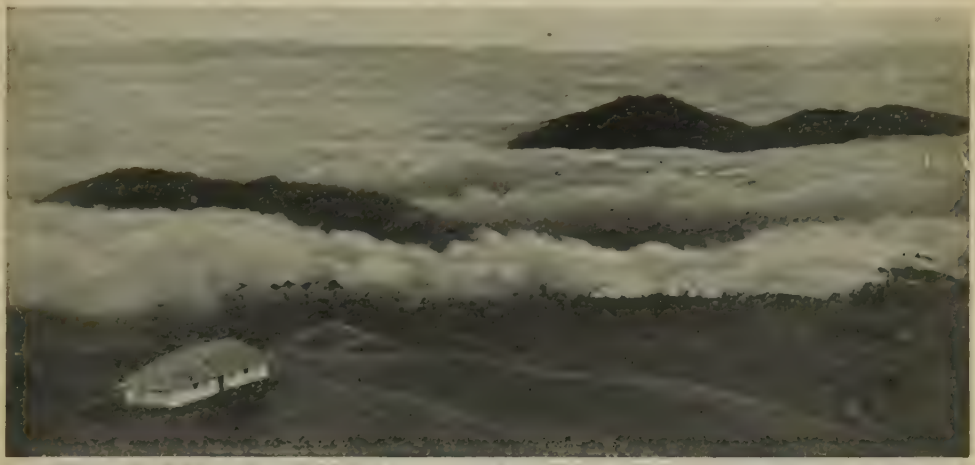
This means that places lying on the margins of these zones will lie at one season in one zone and at another season in another zone, so that as the year progresses they will experience an entire change of conditions. Places so situated that they are not central in one of the zones will experience only a slight change, because the shift is not sufficient to bring them within the adjacent zone.

In the tropical zone there is very little change of temperature from season to season, because the sun is always nearly vertical at noon. In this part of the world, therefore, there is no winter in the sense we know it in temperate climates. At the Equator itself the warmest seasons are the equinoxes, while the coolest are June and December.

In the subtropics, or regions lying just beyond the tropical belt, both north and south, the difference in temperature between summer and winter is more pro-

nounced; but much depends upon whether the place lies always within the same wind zone, or sometimes in one wind zone and sometimes in another.

As we get nearer the Poles the difference between the temperature of summer and winter becomes more and more marked, in exactly the same way as the



LOOKING DOWN FROM DARJEELING ON TO THE WARM CLOUDS THAT BRING THE MONSOON

THE MIDNIGHT SUN SHINING ON HARDANGER FIORD, IN NORWAY

difference between the length of the day and the night becomes greater and greater as we journey farther away from the Equator. Another very important seasonal change of temperature is connected with the distribution of land and water.

It has already been explained that sunshine heats up land far more than it does water. So great is the difference in the effect of solar rays on land and water that an amount of radiant energy sufficient to raise the temperature of a cubic foot of rock by four degrees Fahrenheit would raise the temperature of a cubic foot of water only one degree. When the sun is not shining, however, the water cools only one degree in the same time as the rock would cool four degrees.

For these reasons, during summer, when both land and water are gaining heat, the land becomes much warmer than the sea, but during the winter the sea keeps much warmer than the land. We know that the air takes its temperature

from the radiation of heat from the surface of the earth, whether that surface is solid or liquid; and consequently the temperature of the air at any season depends to a very great extent on whether it is in contact with land or with water. Air lying over the oceans, or over the land lying quite close to the sea, therefore, changes its temperature much less between summer and winter than air which lies over a great continent.

THE EFFECT OF THE SEASONS ON TEMPERATURE AND RAINFALL

The extraordinary difference in the temperature of the seasons brought about in this way is shown by the fact that in the island of Madeira the difference between the average temperature at midsummer and midwinter is only about twelve degrees Fahrenheit, while at Nerchinsk, in eastern Siberia, it is as much as ninety-eight degrees. Similar great ranges of temperature occur in some parts of Canada and Alaska.

The effect of the seasons on rainfall is much more complicated than it is on temperature. Everywhere, except in the tropics, we may expect to find the summer warmer than the winter; but while most places have rainy seasons and dry seasons these may occur at any time of year.

In the tropical belt the zone of the sun, as it swings north and south through the year, carries with it a narrow belt of almost perpetual rainfall. As this belt passes across any place in the tropics that place experiences its "rainy season." Near the Equator the sun is vertical in March and September, and there are accordingly two rainy seasons. Toward the north, where the sun is vertical in June, these two rainy seasons gradually get nearer together till they merge in a single rainy season at midsummer. On the southern side of the Equator the rainy season is in December.

THE GREAT DRY WINDS AND THE WINDS THAT BRING THE RAIN

Beyond the zone of tropical rains we come to the trade-wind regions, where rain is scanty at all seasons owing to the unchanging dry winds. On the poleward margins of the trade-wind zones—that is, about the latitude of the Mediterranean Sea in the northern hemisphere and about that of the Cape of Good Hope in the southern hemisphere—the anti-trade wind zones begin. The anti-trade zones have rainfall at all times of the year. The places which lie on the margins of the two zones, therefore, get dry and wet seasons.

In June, when the trade winds reach their most northerly position, places like Spain, Italy and Syria are very dry; at midwinter, when they are within the anti-trade zone, they have rain. At Cape Town, to the south of the Equator, the rainy season is in June and the dry season in December. Within these belts the farther away from the Equator a place is the shorter is its dry season.

In those parts of the world where the monsoon winds blow, the rainy season is always in summer. At this season the monsoon blows from the direction of the sea, bringing enormous quantities of water-vapor. This condenses into rain as the wind blows over the land, especially where its path is obstructed by mountains. During the winter the monsoon winds bring dry air from the interior of the continents, and there is no rain. The monsoon rains are extremely important to agriculture in India and China.

THE TILT IN THE EARTH'S AXIS AS PART OF THE ETERNAL SCHEME

In speaking of the seasons we must remember that in different climates the word conveys entirely different meanings. In the Far North there are really only two seasons—the long summer of almost perpetual daylight and the winter of black night. Here the length of the daylight is the principal characteristic, for even in the summer it is never warm. In the temperate zones we have four seasons fully developed—the spring, when vegetation is awaking from its long winter rest; and the autumn, the time of harvest, coming between the winter and summer. In the subtropics, and especially in the tropics, the seasons are marked principally by the alternation of rain and drought; and it is this factor rather than change of temperature that enables vegetation to pass through its yearly cycle.

Can we think, as some have dared to do, that the wonderful machinery of the seasons, producing such a variety of conditions so admirably suited to our needs, is due to mere accident? This little tilt in the earth's axis to which we owe the seasons may be thought of as the deliberate work of an immeasurable and beneficent Intelligence, a part of "the great eternal scheme, involving all, and in a perfect whole uniting."

THE NEXT STORY OF THE EARTH IS ON PAGE 2921.

Bringing in the golden grain.

HOW FLOUR IS MADE

CONTINUED FROM 2662

A LARGE flour mill of the present turns out ten thousand barrels of flour a day. The ancient mill consisted of two stones pounding or rubbing together, worked by hand, and grinding at one time enough for the daily needs of the family. The ancient miller was a woman—in times when women were regarded as menials—or a criminal or a slave. The miller of the present is the head of a large corporation buying yearly millions of bushels of wheat, operating a huge plant full of intricate and mysterious machinery, and selling yearly millions of barrels of flour in all the markets of the world.

To understand the meaning and the importance of the present-day flour mill one should know something of the beginnings of milling and of how it has developed and on what it depends. Steam power and electric power, and railroads and steamships to carry flour from the countries that produce wheat to the people all over the world who eat bread; freedom and encouragement to think and to plan and to invent improved processes—these are some of the foundations on which the great milling industry of the present day is built.

Ever since wheat has been grown and flour milled, bread has been a necessity of human life. We call bread the "staff of life." Homer called it the "marrow of men." Some long-ago discovery of the flour in wheat and barley—perhaps by an accidental crushing—led to the cultivation of these grains in every country where they can be grown and to the use of mills of some sort for grinding the grain into flour.

Before the processes of milling can be understood it is necessary to have a clear idea of the structure of a grain of wheat, because the difficulties in the processes are due to the presence in each grain of several very different elements. A grain of wheat is a fruit. It is a store of nourishment on which the germ, which is only a tiny portion of the grain, may feed when it begins its growth. The outer coat of the grain is the husk, coarse and tough, and not used for human food. Inside the husk lies the bran, which has several distinct layers and which, with its inmost layer, the aleurone, makes up about a sixth of the whole grain. This aleurone layer, rich in foodstuffs, surrounds the flour, or endosperm part of the grain; and the problem of the miller is to secure this flour part in as great purity as possible. The germ is very small, amounting to hardly two per cent of the grain, but it is rich in oils and has to be extracted from the flour if the flour is to keep well.

The first flour mill was made of two stones. The grain was placed on the face of one, the nether millstone, and broken or crushed by dropping the upper stone upon it, that is, pounding with the stone held in the hand. Grinding, or turning one stone on the other, took the place of pounding or crushing in the growth of milling methods. An ancient Greek flour mill is thus described: "Two round flat stones about two feet in diameter. The upper stone is turned by a handle inserted at one side, and has a hole in the middle into which the wheat is poured. By the process of grinding, the grain makes its way from the centre and is poured out in the state of flour at the rim."

Many such milling stones exist in Ireland and the Orkneys and Shetlands to-day. Some of the Indian tribes make flour by such methods. The Senecas boil maize and crush it into a paste between loose stones. The Omahas pound their cereal in a hole in the rocks, while the Oregon Indians pound and crush the capsule of the yellow lily. In California the Indian squaws make a sort of paste by crushing acorns between a round stone and a cup-like hollow in the rocks.

With such primitive implements for making flour, milling was at first a domestic industry. Every household ground its own grain for bread. The millstones were necessary household furnishings and the Hebrew law forbade anyone to take them for debt: "No man shall take the upper or the nether millstone to pledge: for he taketh a man's life to pledge."

Whether the upper millstone was lifted and let fall, as in pounding; or rolled, like a rolling pin; or pushed back and forth; or rotated about its centre, on the nether millstone—and all of these methods were used in the development of milling—not much progress could be made in this industry so long as it was worked by hand. Women were employed as millers, both among the Greeks and the Hebrews, and probably among many other peoples. "Two women shall be grinding at the mill; the one shall be taken and the other left." Milling, even in the days of hand power, must have become partly a public enterprise, for prisoners as well as slaves were set to the task of grinding. Samson, a captive of the Philistines, "did grind in the prison-house." Jeremiah pictures the final captivity of his people: "They took the young men to grind."

THE ROTATING MILL WORKED BY MAN POWER OR BY ANIMAL

In one form of mill, the lower stone was shaped like a cup and the upper rounded to fit the cup. In another, the lower was cone-shaped and the upper hollowed to fit over the cone. In another, both stones were flat and the grinding surfaces chiseled into grooves. The edges of the grooves did the grinding, while the meal worked its way along the grooves to the outer edge of the stone. With a long arm, or "sweep," attached to the upper revolving stone, a large stone could be turned, either by man power or by animal power. An ass or a number of slaves would be attached to the sweep, and thus the Roman emperors were able to establish public mills of capacity large enough to supply the poorer people of Rome with free flour. The pauperizing of the people in this way was one of the causes of the downfall of the Roman Empire.

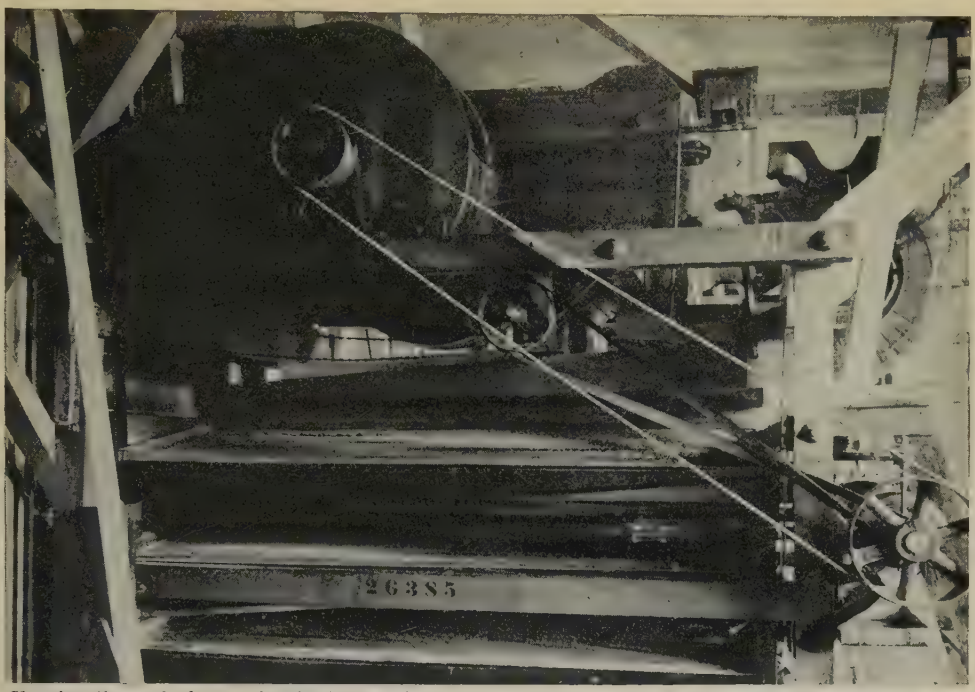
WATER POWER WAS USED BY THE ROMANS

A rapid stream or a waterfall, if used to turn a wheel, will furnish much more power than it is practicable to apply either by hand or by animal power. In the quite recent days of threshing by horse power, ten horses were sometimes used on the sweep. It does not require a large waterfall to supply forty horse power. So, with the water-driven flour mill a new era in milling began. The Romans used the swift current of the Tiber to drive their mills, and water was brought in aqueducts from the hills in the interior to run mills in Rome. This development began about 100 B.C. In the Roman Empire municipal and state-owned mills came into operation, and millers' associations or guilds were formed.

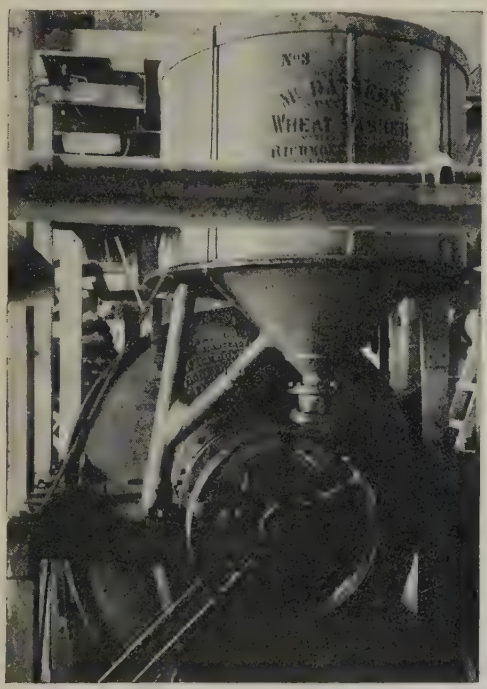
MILLING IN THE MIDDLE AGES A FEUDAL DUTY

Strange as it may seem, there was no improvement in the process of milling from the time of the Roman Empire till the eighteenth century. No new motive power was introduced except the windmill, and no new inventions were brought out to replace the upper and the nether millstones used by the Romans. In the Middle Ages scarcely a miller in Europe owned the mill he worked. The king, the feudal barons, the Church, and the municipal corporations, or towns, owned mills.

SIFTING, WASHING AND BREAKING THE WHEAT



Cleaning the grain by passing it through sieves which remove all dirt, weeds and seeds. The first two sieves are made just large enough for a kernel of wheat to pass through. The lower sieve has holes smaller than a kernel of wheat and allows all the small things to pass through.



After the impurities have been screened out the wheat is washed by being agitated in a rapid stream of water, and then dried. It is now ready to be broken up and sifted. This is done on fluted or corrugated rolls.

The millers who worked the mills were allowed for their work a certain percentage of the grain ground, and the landlord took care in fixing the rent that the miller would retain for himself only a pittance. There was thus no reward for industry and no encouragement to improve the process of milling by new inventions. The miller of the Middle Ages was little better than the slave who worked the mill in ancient times.

Modern milling begins with the steam engine

The invention of the steam engine in the eighteenth century, and its application to milling by James Watt, marks the beginning of the modern flour mill. In 1783 Watt helped to build a large mill on the banks of the Thames. This mill was equipped with twenty pairs of millstones, each pair capable of grinding ten bushels of wheat an hour. Two engines, each of fifty horse-power capacity, supplied the power. Metal cogs and bearings replaced the wooden gearing that had been previously used.

The steam engine meant the railroad, and the railroad made it possible to carry wheat from long distances inland to the mills, and to ship flour to distant markets. With increased transportation facilities large mills began to replace the small country mills, for, by reason of their large output, they could grind the wheat at much less cost. But up to this time there was little improvement in the quality of the flour. The process was still primitive, resulting in a flour dark in color and full of impurities, but at the same time wholesome and nourishing.

The roller mill acts as a purifier

After the application of steam to milling, the next advance was the introduction of iron and steel rollers instead of stone grinders. In the first half of the nineteenth century the idea arose of using such rollers instead of stones. The honor is claimed for several men in France and Austria, but the first important mills were designed by a Swiss engineer named Sulzberger for a Hungarian nobleman. From this beginning the process has been carried to all parts of the world. The four-foot stones could be made to do the work of grinding at low speed, but a roller of only a few inches in diameter and about forty inches long could be driven at high speed.

The power of the steam engine, and the improvement in gearing, coupling, belting and other forms of power transmission that resulted from the mechanical inventiveness of the nineteenth century were the conditions that made the small metal rollers possible, and gradually dispensed with the heavy and clumsy stones. This change was, however, something much more than a new application of mechanical knowledge: it was the bringing of a new idea to an old problem.

The first pair of rollers was not intended to break up the entire grain as the revolving stones had done, but rather to split the kernel, to tear it into pieces containing the valuable elements of the cereals, and to separate the bran. Each pair of rollers carries the process a stage further in separating the starchy materials from the bran, with the result that several different grades of flour are produced by every modern mill.

The question that medical science of to-day is asking is whether this purifying of flour may not have been allowed to go too far. There is much to show that the protein contained by the germ or the bran has a food value not possessed by the beautiful white flour. The whole process of flour-making is, however, a triumph of mechanical skill, of scientific observation and of cleanliness, and it is this process which is now to be explained in detail.

Details of modern milling—blending and cleaning

The wheat from the cars is elevated into bins, each containing one grade. From these bins a mixture, or, as it is sometimes called, a blend, is drawn by the aid of percentage mixers, which regulate the amounts of each grade of wheat that is used to make up the blend. The wheat goes next to the milling bins in preparation for the cleaning processes which are necessary in all good milling.

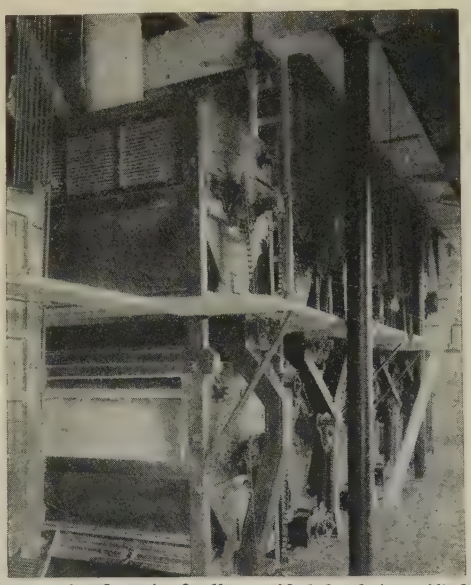
Only those who have seen a flour mill have any idea of the trouble taken to get rid of all impurities, for impurities there are of all kinds. No sack of wheat coming from a farm contains wheat alone. Other seed, such as oats and barley, are certain to be mixed with it. Then there is sure to be some earth and stones and sand. The wheat therefore passes from the milling bins through a system of cleaning machinery consisting of separators which remove all roughages, screenings

GRADING, PURIFYING AND GRINDING

The picture on the left shows you where the floury portion of wheat known as flour middlings or semolina is separated from the bran flakes by sifting. In the picture on the right the flour middlings are graded and purified in sieves of various degrees of fineness of mesh.

The middlings are ground to flour by means of smooth rolls which move at different speeds. The bran does not break up, but flattens out, and may be removed by passing the middlings over fine bolting cloth which lets the flour through while the bran passes over the end of the reel.

and small wheat and seeds. These separators take the form of metallic sieves. Perforations of the first two are just large enough to allow a kernel of wheat to pass through, and therefore oats, straw, and other impurities larger than a kernel of wheat are separated from the wheat in the sieves. The lower sieve has perforations smaller than a kernel of wheat, and this allows small seeds and impurities to pass through. Thus the wheat passes from the separators partially cleaned.



Here the flour is finally purified by being sifted in contact with a regulated current of air. Sieves separate by size according to the perforations used. Air separates by gravity; coarse and relatively heavy material is retained by the sieve, fine heavy flour passes through, and relatively light dust is removed by the air current.

SCOURING AND TEMPERING OF THE WHEAT

From the separators the wheat passes to what are called the scourers, which remove all the dust and a portion of the screenings. The scourer is an upright perforated cylinder with large beaters revolving on a shaft within the cylinder. The wheat falls down in the centre and, being struck by the beaters, is thrown against the outer case. This removes a thin tuft of hair at the end of the wheat kernel. When the wheat was growing, these hairs were in reality tubes to carry off superfluous moisture, but now they have done their duty and have to be got rid of. This is done by driving the kernels against the outside of the cylinder and allowing them gradually, in spite of the beating, to fall to the foot of this container. While the wheat is falling through the cylinder a strong current of air passing upward carries off the dust from the scouring.

From the scourers the wheat goes to the oat-separator, where all the oats are removed. The wheat is then heated and sent to tempering bins, where water is added. It is then allowed to stand anywhere from three to twenty-four hours, according to its hardness. It is strange to think that wheat should be washed, but washed it is. It is dried first of all in a "whizzer," which spins the grain round at such a speed that most of the water is thrown off by centrifugal force, and then it is further dried by alternate blasts of hot and cold air. Once again it is scoured; for a second time it is heated and sent to a small bin above the "first-break" rolls where it is held for twenty minutes before entering the milling system proper.

HOW HIGH MILLING DIFFERS FROM FLAT MILLING

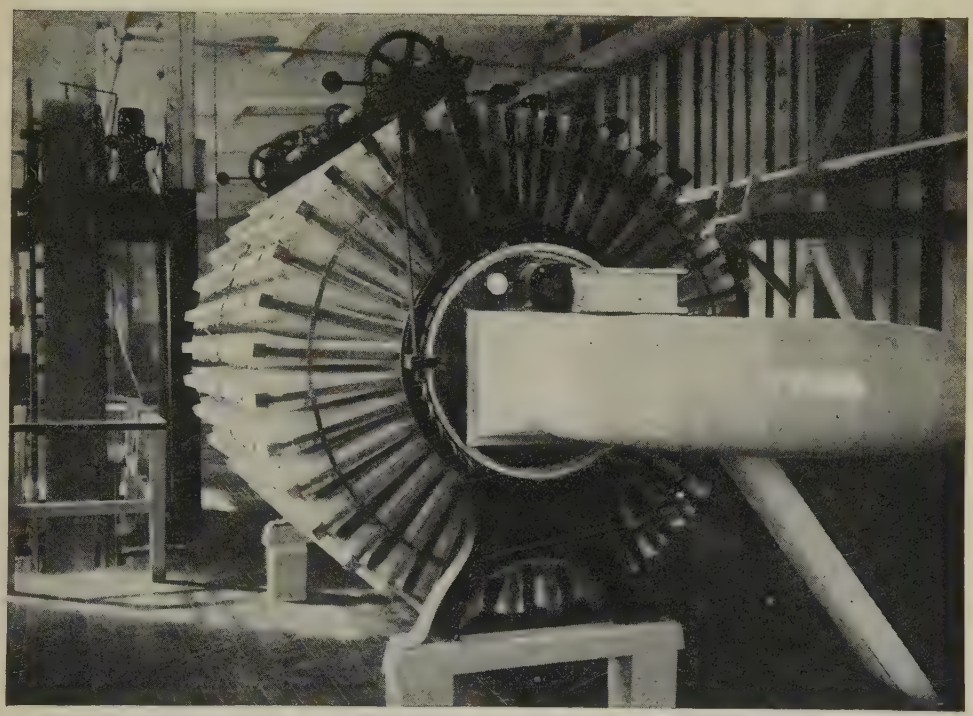
The wheat is now ready to be broken up, and flour, feed and other by-products extracted from it. Before this process is described, remember what the modern miller, with all his elaborate machinery, is trying to do. The old "flat" milling with stones sought to grind as perfectly as possible in one operation the whole grain, and then to separate the flour from the bran. In "high" milling, as the modern process is called, the object of passing the grain through the first pair of rolls is to break the kernel up into comparatively large fragments and to make as little flour as possible. The flour made at the early stage is apt to be dark in color and poor in quality. The miller expects to get from this first process "semolina" and "middlings." Semolina is the larger-sized particles of grain, and the middlings the middle-sized particles.

GRINDING AND SEPARATING

The first pair of rolls, therefore, which the wheat passes gives what is called the "first break." These rolls have grooves cut lengthwise and revolve against one another, one roll moving faster than the other. They are set so that they will cut rather than crush, nip rather than flatten. The whole of this cut and torn wheat is then sifted through a series of sieves, and the coarse part, which does not pass

through, is sent to another pair of rolls set somewhat closer together. The sifting and the crushing process is performed five times, until all the starchy materials are separated from the bran. At this stage the original kernels have been divided roughly into flour, middlings and bran.

The middlings must now be divided into various grades according to size. This is done by passing the middlings over sieves covered with various sizes of bolting cloth. The first sieve has a very fine cloth through which the flour passes. The next section is covered with cloth slightly coarser through which the finest grade of middlings pass. The following sections have cloth a little coarser than the last, until the end is reached. The middlings which pass over the end are too coarse to pass through the last cloth and are called No. 1 middlings.



Showing how the dust is collected by dust-collectors of distinctly ingenious design.
Courtesy, The Ogilvie Flour Mills Co. Photos, Fryer's Studio, Fort William.

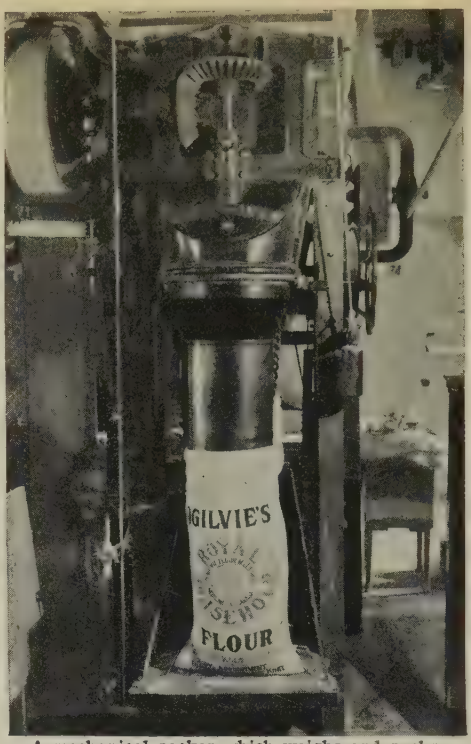
THE PURIFYING IS DONE BY A SIEVE

After the middlings are graded they pass on to a machine known as the "middlings purifier." This is a long narrow sieve with a strong current of air passing upward through the cloth. The middlings travel slowly from one end of the sieve to the other. The strong current of air carries off the fine dust into a dust-collector. The fine bran, being much lighter than the middlings, is suspended by the air current above the cloth. The middlings, with their greater weight, go through the cloth. The bran is carried by the current of air to the tail of the machine and is thus separated from the middlings.

Each break makes a quality of stock entirely different and distinct in itself which is purified and sent to different parts of the mill to be reduced into flour of varying grades. The reduction system starts with sizing the large middlings and taking a portion of flour from each grinding. This is kept up until the tail of the mill is reached and all the flour has been extracted. The rolls are different from the first-break rolls inasmuch as they are smoother and a little closer together, but they move, like the break rolls, at different speeds. The bran does not break up, but flattens out, and may be removed by passing the middlings over a fine bolt-

ing cloth which lets the flour through while the bran passes over the end of the reel. This flour contains small particles of bran and therefore cannot be graded as high as the other flours. When the tail of the mill is reached, all that is left of the wheat is fit only for feeding-stuff for animals.

Every flour mill thus produces several different qualities of flour, but, while white bread is greatly valued because of its beautiful appearance, it should be remembered that bran bread and Graham bread are even more wholesome. In certain things that we eat there are what are called vitamins. These vitamins are concerned with growth. We cannot see them; we only know that they are there and that they are of infinite value in maintaining health. During the siege of Kut-el-Amara, in Mesopotamia, in the World War, the garrison suffered greatly from shortage of food. The British troops, using white flour only, suffered to some extent from the dread disease called beri-beri. The native soldiers, whose bread had in it some bran and some of the wheat germ, remained free from this trouble.



A mechanical packer which weighs and packs.

THE NEXT STORY OF FAMILIAR THINGS IS ON PAGE 2915.

Large elevator for cleaning and storing the grain preparatory to its shipment by rail or water. After it has been cleaned and stored the grain is transported by conveyors lengthwise over the building, and by spouts to the bins. Photo, Land Department, Canadian National Railways.

Photo, courtesy of United States Forest Service.
Forest Rangers breaking camp after a night's rest.

THE FOREST AND ITS GUARDIANS

CONTINUED FROM 2680

BEFORE the white man came to North America the greater part of the land surface of what is now the United States was covered with forests; the great plain of the Middle West was the exception. In these forests the many tribes of Indians lived and hunted. They used wood for their fires, for their weapons and their lodges, but their wants were so small that little damage was done to the forests. With the coming of the white man the forests began to suffer. Not only were trees cut down to make houses, ships, tools and other useful articles, but lumber was sent overseas to be sold in Europe. To clear the land for farming, trees were cut down without mercy and frequently were left to rot unused or else were piled into heaps and burned. In those very early days no one thought that the forest wealth which was being wasted would be regretted in future years. The attitude of the first settlers was one of indifference, while some seemed to regard a tree as an enemy to be destroyed.

In 1691 some British officials began to wonder whether the supply of trees would last forever. An order was issued in Massachusetts reserving for the use of the navy trees two feet or more in diameter. This may be called the first conservation law in America, but it was not allowed to stand long, and the waste continued. After the thirteen colonies became a nation, and population and industry increased, the destruction of forests went on still more rapidly. In 1876 it was estimated that nearly half of the land originally in forests had been cleared, and the demand for lumber continued to increase.

Men had become alarmed, and in 1876 the Commissioner of Agriculture was ordered to have a study of the situation made, and soon thereafter a Division of Forestry was created. At first the appropriations were very small and the office was little more than a bureau of information, but it was at least a beginning.

Thus did this continent join the world movement to conserve the rapidly disappearing forests. In Europe three quarters of the original forest has disappeared. In Asia the proportion has been even greater. Japan has had some kind of forest-protection laws since early times, but China has allowed her forests to be cut down, until now she has only six per cent of her land surface in trees.

In Europe, Germany was the first to start a forestry movement, and there

is a record that in 1165 cutting was forbidden at Lorsch, in the Rhenish country. In Italy, St. Francis of Assisi spent much of his time in cultivating silver fir and beech forests around the monastery at Monte Alverna. This was an excellent beginning, but unfortunately the Italians grew careless and allowed much of their wooded area to be logged, so that now only seventeen per cent of the land surface in Italy has trees upon it. Forest conservation in Switzerland dates from 1304, and has been faithfully carried on up to the present. France saw the danger of a treeless heritage at the beginning of the eighteenth century. Denmark waked up to what was happening. Sweden, Norway and Great Britain followed.

THE FIRST LAND SET ASIDE AS A FOREST RESERVE

The United States Government still owned millions of acres of land which had not been assigned to settlers. The first move to save this from the ax was the Act of 1891, giving the President of the United States permission to set aside land as Forest Reserves. The Yellowstone Park Timber Land Reserve was set aside by President Harrison in the same year. Other forest land was set aside by him, by President Cleveland and by every president since, but not until the administration of President Roosevelt did the work assume its present importance.

Much credit is due to Gifford Pinchot, a graduate of Yale, who became interested in forestry while at college. Later he studied forestry in France, Germany, Switzerland and Austria, and began the first practical forest work in the United States on the Biltmore Estate in North Carolina in 1892. In 1898 he was appointed Chief of the Division of Forestry. During his administration the Division became a Bureau, and in 1905 the present Forest Service was organized. Two years later the name Forest Reserves was changed to National Forests.

President Roosevelt supported Pinchot's ideas, and set aside more land than all the other presidents together. To those two men of vision the country owes the present Forest Service—the defenders of the forests. It is easy to think of these defenders as members of an army with its general the Chief Forester. From the general headquarters in Washington, D. C., orders are sent to tree-guarding officers and men.

HOW THE FOREST SERVICE IS ORGANIZED

As the National Forests mainly lie in the West, six local administrative offices have been set up. A very close connection is kept up between Washington headquarters and these offices, as men are constantly going back and forth between them. The Forester is the man in command who gets reports from workers all through the country; he determines the general policy of the Forest Service and places it before the Secretary of Agriculture. He has to ask Congress for the money to run his department, and of course he has to explain how he will use the money when he gets it. The Forester also recommends all appointments to, and promotions in, the Forest Service. Another of his duties is to have published, for the use of anyone who wants it, the information collected by people under him. The Chief Lumberman of the Service reports directly to the Forester. So we can understand that the Forester is a very busy man.

The other people at Washington are kept just as busy as their Chief. The work of the headquarters is divided into seven branches. Two of these branches, Accounts and Operation, look after the money and business methods of the Service. The third branch is called Silviculture. We know, from our study of Latin, that *silva* means "forest," so we can say that Silviculture means "the art of caring for forests." By this branch is gathered all that is known about the nature and growth of trees, not only in this country but in other countries as well. Silviculture men make experiments to find better ways of encouraging the growth of important forest trees. Forest investigators bring to this branch the results of their efforts to find out how many trees there are in the forests and how fast they grow. It is by this branch that large timber sales are approved, and it has the power to work with the several states either for the advancement of forestry or for fire protection. We should not be far wrong if we said that the branch of Silviculture is the most important of the seven.

THE PEOPLE ARE ALLOWED TO USE THE FORESTS

The fourth branch, Grazing, looks after the leasing of parts of the National Forests as pasture grounds for millions of

THE EYES THAT WATCH THE FORESTS

On forest-fire patrol duty in Manzano National Forest, New Mexico. From every raised point the Ranger scans the country around for a wisp of telltale smoke.

The telephone plays an important part in keeping the Forest Watchers in touch with each other and with their headquarters. A fast message often means a forest fire prevented.

Heliographing from Black Butte Lookout, California National Forest, California. Where it is impossible to string a wire, this method of signaling is often used.

Photos, courtesy of United States Forest Service.

cattle, horses and sheep. This foraging-ground is very necessary to animal-owners, and the Grazing branch arranges the leasing so that little or no harm will be done to the young growth which will be the forest of the future. The next branch, Lands, deals with the use of lands in the National Forests for farming, ranching, mining or other purposes. The Lands branch issues permits for the use of water-power sites on government land.

The sixth branch is called Forest Products, and is concerned with the uses of wood and other materials produced by the forests. Timber is tested to find out its strength; wood-pulp is studied; methods of preserving wood are experimented with, and the diseases of trees and wood are investigated thoroughly. The seventh, and last, branch is called Land Purchase. It decides which forest lands are best for the United States Government to buy when the country is in the market for more national-forest reserves. In the local offices in the West there are also seven branches, but on a much smaller scale.

We have said that the Chief Forester and his assistants at Washington are like a general and his staff. We can also say that the other divisions of the Forest Service are like divisions of an army in active service. Forest Supervisors, Forest Examiners and Forest Assistants form a group which may be called the "men behind the lines." The "front-line" men are the Forest Rangers and Forest Guards.

SOME OF THE MANY DUTIES OF A SUPERVISOR

Gifford Pinchot, in his book The Training of a Forest, says that the Forest Supervisor is the general manager of a National Forest. Every boy and girl has heard of the general manager of a store or other business, but it may sound strange to speak of the general manager of a forest. Yet that is the best name for the man who takes the responsibility for the protection, care and use of the National Forest. He has to make his charge as valuable as possible to the people in the district. The Supervisor holds the highest job in the "field" work of the Service. People of the country around go to him for permission to allow their stock to graze in the forest. He sells small quantities of timber, and sees that yearling trees are planted. He is responsible for the roads and trails, for the prevention and control of forest fires, and for clearing out the dangerous wild animals.

There are so many things that the Supervisor is responsible for that it would be impossible for one man actually to do the things. So, much has to be handed over to the men under him—the Forest Examiners or Forest Assistants. These men study their forest thoroughly. They learn what kinds of timber grow there and how quickly growth takes place. They know the number of trees of each kind, their value, and in what part of the forest they grow best. This information a Forest Examiner makes into a working plan with the aid of survey maps. It is the Forest Examiner who must be on the spot when any timber is cut down, and on him rests the burden of whether a timber sale is forest protection or forest destruction. Boys and girls who walk through the woods may not think of the danger of fire that lumbering always brings. But every time a tree is cut down chips and sawdust, dead leaves and twigs are left on the ground. If the weather is dry, these piles, or "slash," lie ready to take fire at a slight spark. The Forest Examiner insists that this slash be safely disposed of.

It is the Forest Assistant who has the extremely interesting task of marking the trees which are to be cut down. This is done by "blazing" (cutting a chip of bark to show the wood underneath) each tree and stamping the letters U. S. upon the blaze with a government marking ax or hatchet. In localities where fire has destroyed the trees the Forest Examiner establishes a forest nursery. He decides which trees should be planted and determines the method of raising and planting them. Then he collects the seed or transplants young trees from other sections. It is work for men who thoroughly understand the habits of trees.

WHEN FIRE BREAKS OUT IN A NATIONAL FOREST

Now we come to the front-line men—the Forest Rangers and Forest Guards. These men spend practically all of their time in the forests, and their most important task is to protect their districts against fire. A forest fire is most terrifying to see, and is highly dangerous and destructive in its results. A tiny spark will burst into a flame among the dried

ANIMAL AND MACHINE HELP THE FORESTERS

To aid in forest protection, fire-tool boxes are transported and placed in strategic positions throughout the forests. In each box are placed fire tools sufficient to equip from five to twenty men. These boxes are carried by mules or pack horses.

An automobile mounted on car wheels and fitted with fire-fighting tools is used as a fire-patrol speeder along the line of the San Joaquin and Eastern Railroad, California.

Photos, courtesy of United States Forest Service.

leaves and wood. This flame will spread to the underbrush and begin licking the trunks of trees. If the season is dry and a wind is blowing, it is no time at all before a raging fire is eating up the forest. It eats in great snatches and with a roaring noise. Huge trees are green one moment: a few moments later they are flaming torches; and when the fire-dragon has passed on they are bare charred poles or ashes. Wild animals or human beings have little chance of escape if they are hemmed in by a forest fire, which travels quicker than they. Once seen, a forest fire can never be forgotten; nor can the sight of a fire-eaten area of what was once a forest. The blackened ghosts stand as a pitiful warning to guard against fire.

It is the Forest Ranger or Forest Guard who must bear in mind that dreadful warning. Night and day during the season when fires are dangerous the Ranger or his assistant patrols his district or watches from certain high points called fire-lookouts. He keeps on hand at convenient places supplies of fire-fighting tools, and he sees to it that the trails are open and that the telephone is in working order. Lately the airplane has proved extremely useful in discovering a wisp of smoke that means the beginning of a fire.

What the Forest Ranger Does at a Fire

When smoke is seen it is the business of the Ranger to get to the spot with the utmost speed and to bring tools and men to fight the fire. As some of the forests, especially those in the Northwest, cover mountain and valley for miles, the task is not easy. Rangers always try to prevent fires from starting, which is better than having to put them out once they have gained ground.

The Forest Service is proud of the record of its Rangers for bravery and devotion to duty. Gifford Pinchot tells the story of how courage and clear thinking on the part of Ranger Edward C. Pulaski saved many lives out in the Cœur d'Alene National Forest. Pulaski had forty Italians and Poles under him as emergency fire-fighters. But the fire gained on them. Soon it became apparent it would be impossible for the party to travel through the dense forest fast enough to outdistance the flames. Pulaski thought of an abandoned mine in the neighborhood and to it he led the men. Sending all the others back into the mine workings, the Ranger hung a wet blanket over the mouth of the mine tunnel and stood on guard. Some of the workers went temporarily mad with heat, stifling air and fear. They tried to break out, and one did escape, but he met his death in the raging furnace outside. The others Pulaski held back at the mouth of his revolver for five hours. Until the fire had passed, Ranger Pulaski stood on guard. The laborers were saved, but Pulaski himself spent months in the hospital as a result of the burns he received.

The Ranger Is a Policeman as Well as a Fireman

The Ranger is not only a fireman: he is a policeman too. He has to protect his district against men who try to steal timber and to claim government land without rights. Fake homesteaders and miners seize upon land to which they have no right, and the Ranger has to put them off. In the Ranger's work comes the granting of free use of certain lands by settlers who live in, or near, the National Forests. Now comes what seems strange work for a woodsman—the Ranger must know something about raising cattle, sheep and horses, because he looks after the use of his district as a grazing-ground. So he has to know the brands and marks of the owners of animals which pasture in his district. As the Ranger is under the Forest Supervisor, it is to him that the Supervisor intrusts the clearing-away of the slash, the measuring of the timber sold, the overseeing of the use of streams for water power and many other duties.

It is almost a general rule that men enter the United States Forest Service as Rangers and rise by their own ability to other offices. So we can still think of our army comparison. Even graduates of schools of forestry are recommended to enter the Service in the lower rank to gain experiences that fall to Foresters.

What a Forest-Service Man Is Expected to Know

It is surprising what a number of subjects a Forest Service man is supposed to know something about. He must know ordinary school subjects and must have a college degree in forestry. The college degree is proof that he has a working knowledge of dendrology, forest physiography, silvics, forest economics, forest engineering, forest mensuration, forest management, forest products, lumbering,

HORROR AND SORROW TOUCH THE FOREST

The meanest job on earth is fighting fire, but the Forest Service keeps on fighting until the flames are under control.

From an up-to-date fire-lookout observatory, such as the one in the insert, the Watcher sometimes has to behold a burned-over area which could not be saved by the Rangers.

Photos, courtesy of United States Forest Service.

forest law and forest history. Dendrology means just a study of trees and shrubs by their shapes and where they are found. Forest physiography concerns the kinds of soil in which trees grow. Silvics is the knowledge of the behavior of trees in relation to light, heat, moisture, air, soil and other trees. Forest engineering takes in surveying, map-making, putting up telephone lines, bridge-building and other construction work useful in the woods. Every boy or girl who has had mensuration in school work can guess that this subject has to do with the measuring of trees and timber. Forest law is necessary because the federal government and the different states have made laws about public lands, forest and fire protection. History of forestry in Europe and in the United States is important.

A Forester must be able to travel the forest alone by day and by night. He should be a good fisherman and a good hunter, and should be deeply interested in both fish and game. He should be a good horseman and should be able to pack and handle horses in the woods. He should have also some knowledge of first aid to the injured. From the lowest-rank guard to the Chief Forester at Washington, the aim of each member of the Forest Service is to know as much as possible about forests. And he tries to fit himself for his task in every way he can.

It is in the great forests of the West that we best can see the field members of the Service at work. California, Oregon, Washington, Arizona, New Mexico, Nevada, Wyoming, Montana, Utah and Idaho offer the greatest opportunities in Forest Service under the government because they have the largest wooded areas. In 1923, the area of the National Forests was 157,502,793 acres. Alaska, of course, has enormous tracts of untouched forests, but at present these do not need the attention that is needed by the National Forests within the borders of the United States proper.

Photo, courtesy of United States Forest Service.
The future forest trees as tiny seedlings in the Savenac Nursery seed beds, Lolo National Forest, Montana.

Taken all in all, the life of a Forester has many advantages. For the most part it is a healthful existence in the open air, very close to nature. It is a life on the trail and in the saddle. It is inspired by a love of the outdoors as well as of men. And its aim is one of the greatest and most unselfish held by men—building for future generations.

THE NEXT STORY OF THE UNITED STATES IS ON PAGE 3025.

TWO OF THE USES OF THE NATIONAL FORESTS

This photograph shows the entrance into Wasatch National Forest, Utah, of a flock of sheep. Forest Officers count the flocks before they leave the corral in order that the Government may determine the amount of the fee due for the use of the range.

Railroad ties cut from National Forest timber are counted and stamped "U.S." by Forest Officers before they are marketed. The Government charges the cutter so much per tie hewed from green or dead trees picked out by men of the Forest Service.

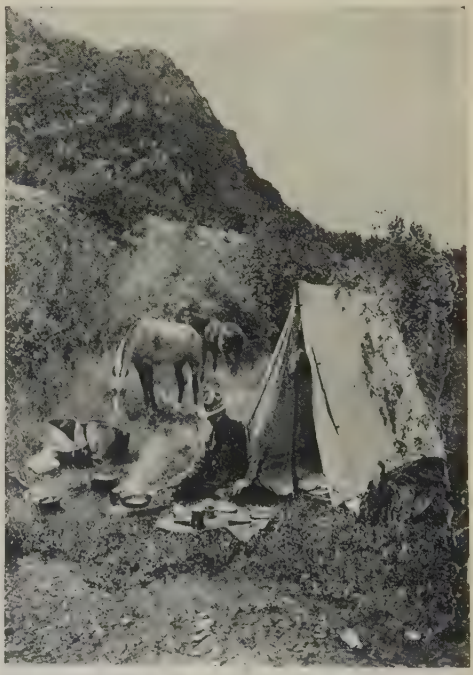
Photos, courtesy of United States Forest Service.

WINTER AND SUMMER WITH THE RANGERS

Forest Officers running a base line in Holy Cross National Forest, Colorado.

A snowshoe trip through the forest to mark the timber to be cut down.

Planting crew setting out yellow-pine seedlings in Pike National Forest.



One qualification for Ranger or Forest Officer is an ability to live in the out-of-doors.

Photos, courtesy of United States Forest Service.

"Welcome Guests."

JACK MINER, THE MAN WHO LOVES BIRDS

CONTINUED FROM 2693

ABOUT two miles north of the little town of Kingsville, Ontario, is the farm and bird sanctuary of Jack Miner, on the north shore of Lake Erie. Miner's parents were English people who emigrated to Ohio from the Old Country. When Jack was thirteen his family came to Canada, and it is the original Miner homestead to which the birds are now encouraged to come.

As a boy Jack took to the woods as naturally as a "park hare." He loved animals from the first, and had a succession of pets from a blue jay to a 'possum. He took one of the family's old pewter spoons to make bullets to shoot his first deer—his mother, unsuspecting, standing by. Then for a while Jack and his brother Ted took to hunting grouse and quail in earnest for the market. They soon outgrew this practice, however, and hunted for pleasure only, with two bird dogs—brothers also.

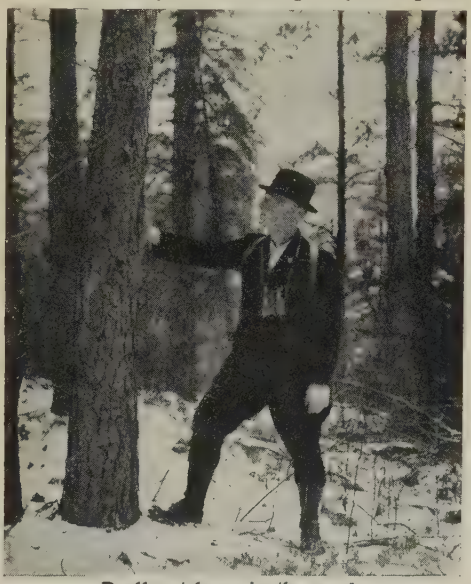
As Miner grew to manhood and became the father in a little home, he had to take life a little more seriously. But even though many of his hours were spent in his tile factory, he would get a short interlude of the outdoors whenever he could, strolling by twilight before breakfast, as the last stars were closing their eyes for the day, and hearing in the crisp October morning the faint call of the quail and the note of the wood-thrush.

So life went on. Trouble came, and in a short while three members of his family circle died within a short period. He was exceptionally sympathetic and loving, and for a while it seemed as if grief might crush him. Then he turned from it and became active in social and Sunday-school work, and pursued his hobby of making friends with the birds with more zeal than ever. By degrees he secured possession of the entire Miner homestead, and little by little beautified it with thousands of evergreen trees and flowering plants.

His brother Ted, who was closest to him—with him he had played, hunted, slept and lived—met with a tragic end while on a hunting trip in northern Quebec. The brothers were in the woods with a friend, and Jack at the head of a ravine drove a bull moose down toward the two men. He heard a shot and ran toward it, sure that the hunters had made a kill—only to meet his friend running toward him frantically shouting: "I have killed Ted!"

They were twenty-five miles from

the nearest railway station, and Jack buried his brother in the snow for fear of wolves, and ran thirteen miles to the nearest settler's cabin, where he procured help from an old man and boy. Returning to the scene of the tragedy, they improvised a litter, but the snow was so deep that it was impossible to proceed except in single file. Jack took the body of his brother across his shoulders and carried him almost the entire distance of thirteen miles to the lake, while the other three men cut brush and broke trail. At the lakeside they placed Ted's body in the bow of a home-made punt, and Jack



Really at home in the woods.

then paddled twelve miles in the full of a snowstorm.

He has made many rescues in the woods, and in the trackless forest he seems to have the senses and perceptions of an animal. He can follow a trail all day long in any direction and at nightfall turn his face directly toward camp.

Miner's love for birds has found vent in very practical ways: not only has he sheltered and fed thousands of hungry birds that visit his Sanctuary year by year, but in his lectures and by his example he has striven to influence people to protect rather than to wipe out their feathered friends.

In his endeavor to know the birds he has made many interesting experiments, of course, and had countless fascinating experiences. He warns us against the birds' natural enemies, or "cannibal birds," as he calls them. (The worst are the hawks, and of these the medium-sized ones are the greatest offenders.) Then there are the weasels. These took his pheasant eggs and his young chickens and turkeys, so he built attractive-looking harbors for them, setting concealed traps in the centre and baiting them with hen's feathers. The traps were so successful that he caught fifty-seven weasels the first summer, and soon almost killed the pests off in his neighborhood.

Miner has pet robins around his place because he encourages the brave and cheery little birds. As soon as the worms start coming to the surface in the spring someone must send the robins a telegram, for up they come north, no matter how cold it is. They stay until the worms go under the ground for the winter. To the average farmer Robin Redbreast is a benefactor, for he cleans up the cutworms that destroy the crops. It is true, though, that he sometimes takes a little fruit.

Miner loves the woodpeckers as forest-protectors, noting how they make gimlet holes in the worm-eaten wood and then with their long sharp bearded tongues draw out the grub. Six different varieties of swallows had at some time or other visited his part of Canada, and he was not content till he had every variety of them coming again regularly with the seasons. To lure the pretty purple martin, with the assistance of his neighbors he set up a twenty-roomed dwelling one evening, and early the next morning he saw from his window a pair already hovering round the house.

On one occasion on the Miner farm a wild house cat robbed an old gray duck of her seven young: the poor old lady carried on pitifully for two or three days and then disappeared. Miner went to visit a brood of ducks that a hen was sitting on, and found that all had hatched and gone but two. Where were they? Suddenly he saw the eyes of old Mrs. Duck sitting motionless in the weeds just in front of the coop. From her wings stuck out a little head! She was stealing the hen's ducks just as fast as she hatched them! And she stole them all and raised them all.

To prove that birds return to the same homes year after year, Miner started a system of putting bands of aluminum bearing his address on one of the birds'

WILD CANADA GEESE IN THE MINER SANCTUARY

For four years Miner strove to induce the wild Canada goose to recognize him as a friend and to visit his Sanctuary. He put seven tame wing-clipped geese on his place, but for a long time no wild ones came.

In the fifth spring of his attempt they came, and thereafter every spring saw their arrival in ever increasing numbers. To tag them and so learn their nesting-places he devised a wire inclosure between his ponds.

Every spring now the geese come to Miner's place at Kingsville in their flight from the South, where they winter, to the Far North, where they breed. After a brief rest they start north late in April or early May. Upper photos, R. D. Sloane, Leamington.

legs. If the birds were killed, these tags were returned to him from every quarter, and he was thus able to learn the stretch of their winter or summer flights. If the tagged birds came back, it added to his proof of the birds' choice of the same home each year. One spring he presented four little ducklings with a leg-band and the names of Polly, Delilah, Susan and Helen. The sisters flew away in December. Helen was shot the next day, but Polly, Delilah and Susan came back again on different days in March. They migrated again in the fall, and this time Susan fell to the sportsman's gun. Polly and Delilah returned, as before, in March. For four springs the wild ducks continued to come. Then one winter Polly did not migrate and was shot by a wild-goose hunter. Delilah came back for three more summers, each time raising a family.

Because of the tags many interesting people and letters came to the Miner home. The tags came back from the far, frozen North, often sent in by Hudson's Bay Company officers who had received them from Eskimo hunters, and from the southernmost limit of the ducks' flight. A lady from the South wrote as follows:

DEAR MR. MINER: I think you will be interested in knowing about some of your geese and ducks. While I was in Mississippi last winter I visited in Louisiana and Arkansas. Along the last of November some of the negroes on the plantation went over on the sand bar to hunt for wild geese, and they got several ducks and two big gray geese, and on one of the legs was a tin tag with a Bible inscription on it. The old darky that happened to get it was a great preacher, could not read a word, but was gifted with lots of gab and exhorted quite a lot. He thought the message came down from heaven, and they had quite a revival over it. I heard him one night and he said: "This am the message of the Lord. I saw Him descending with this fowl in His arms, and it flew right at me. And now am the Judgment coming, and we are the elected, and am going straight to His arms." I don't remember just what verse it was, but I remember it was your address, and think perhaps this will interest you.

Miner has become well acquainted with the Canada goose. His interest dates from quite early, when he went hunting them on an old lighting haunt of theirs not far from his home. He used decoys, and after these were placed he lay in a cavity under an earth-colored blanket and waited till the geese bowed from the sky to light beside the blocks of wood. The painted geese were not right, and suddenly the real ones took alarm and wheeled high again. Then Miner bought seven wing-clipped Canada geese and fed them in a mud hole on his farm. The geese became very tame and roamed around on some ten acres, making the mud hole their home. For four years these live decoys attracted no wild geese, but in the fifth spring the whole neighborhood was awake one morning early. "The geese have come! The geese have come! Jack said they would come!" And everybody arrived with a gun!

Jack had to explain that if they did not shoot at them right away, the geese would settle down and make the farm their spring home. Everyone was reasonable and agreed to wait till the signal should be given—which it was after three weeks. Six geese remained when the hunters had fired, and Miner was sure that these would return from their migration. They came, bringing twenty-six others along, and once more the Miner neighbors made only a reasonable kill, and the third spring more than four hundred geese came.

On one shooting expedition a big gander fell with a broken pinion, and Jack took him up and performed a surgical operation on him. He had a brother with the flock, and when the others migrated north in May, this self-sacrificing gander gave up all his liberties on the North American continent to live in captivity with his lame brother. The Miners nicknamed them David and Jonathan, and Jonathan tried hard to get David to fly once more. The two lived together in the park for seven years, but one morning as Miner looked out of the window he saw dear old Jonathan lying dead on the snow near the centre of the pond where they always roosted. They read the story from the tracks in the snow. A great horned owl had attacked the geese in the night, and all of the clipped-wing geese, including David, ran under the evergreens and shrubs. Jonathan, having both wings, gave the enemy battle, but in the darkness the owl sank his talons into the gander's head, put his eyes out and killed him.

All through the day at the homestead the inquiry kept coming in, "Is it true that an owl killed old Jonathan?" A sigh—then the receiver was hung up.

WILD WING-TIPPED SWANS NOW HAPPILY AT HOME

Miner avenged his pet's death. He set a trap in its feathers which caught the owl that very night.

Jack Johnson was an old gander whose mate laid six eggs one year near an old rail fence. He got his name because he was ready to scrap with any approaching enemy, and on one occasion attacked a cart horse that, grazing, unconsciously approached the nest. The old goose sat always in the sun, from which there was no protection, and finally became ill and left the eggs. So Miner and some men fought old Jack away and set the eggs under a Plymouth Rock hen. When they were hatched they were set in a pen near the back door in a clump of clover.

Meanwhile the poor old gander was screeching around the farm looking for his eggs, and returning every few minutes to his sick mate, who stayed in the pond near the nest. One morning in June, Miner coaxed the goslings to follow him through the barnyard to some clean grass. There he left them, but he had gone only a few yards when he heard old Jack Johnson coming from the pond flapping and honking like a creature that had gone completely mad. He reached the goslings before Miner could, and when he

JACK FEEDING SOME OF HIS FRIENDS

Photos, R. D. Sloane, Leamington.

got within six feet of them he stopped and, with his head and neck straight into the air, honked his loudest. The goslings understood what he said and lay flat on the ground. Then old Jack put his head on each, caressing and loving them, and in turn each got up and flapped its baby wings. Then, attracted by Jack's honks, came the poor sick mother, falling down with weakness every few yards as she tried to reach her brood, for it was her first trip off the pond. Jack ran to meet her and told her all, and she tried to come faster. Finally the eight all started back to the pond. Jack happened to look back and he saw the foster-mother hen following. He gave her one blow with his wing which sent her screeching to the chicken house. The next day her little brood went to seek for her, Jack following them, and when he saw what good terms his children and she were on, he accepted her as one of the family, and she lived at the pond with the geese till the snow drove her indoors again.

The poor old mother grew no better, and one day in winter Miner left her in the cow-stable—from which he had turned out the cow—while he went to the house for medicine. Old Jack flew at the cow and drove her round the corner, but when Miner returned, the old goose was dead.

Jack never saw her again, but he fought the cow for two or three weeks, and then for two and a half years settled down to watching her. In the summer he slept at her head in the pasture; in the winter he slept on the doorstep of the stable. But he never got over the loss of his mate, and finally his sad honking grew so unbearable that Miner was obliged in self-protection to get rid of him.

In order to get information about the nesting-ground of the Canada goose, Miner tagged his visitors! That is an easy thing for me to write and for you to read, but it took him over seven years to perform the trick! His efforts even became a family joke, but his persistence finally won out. He built a large wire-net inclosure between his two ponds, with a trap-door at each end. He educated his domestic geese to winter under this, and in the spring, when the wild birds came, they went in under to feed also. Miner waited till the greater part of the flock had gone north, so as not to frighten them; then he pulled the trap-door on sixty-one and tagged these. Each year a larger number was available, and from the answers received to many of his tags, from Indians and Hudson Bay employees, Miner was able to locate the nesting-grounds of his pets in the far-north frozen Hudson and James bays.

Of the two varieties of native swans, the trumpeter and the whistling, the former, which is the largest migratory bird in America, made its nest in cultivated parts of the country and has been almost exterminated. The whistling swans came to Miner's place, after the geese had adopted it, in such large numbers that the surface of Lake Erie near his home is at times white with them over a large area. Some wounded ones that had floated over Niagara Falls were sent to him, and from their number he is trying to raise a flock.

Miner advocates the making of bird sanctuaries. A bird sanctuary such as his is a suitable area of ground set aside for the birds to congregate in for shelter, food and protection, where their natural enemies are destroyed. The migratory birds will come here in great numbers as they get to know it, and the non-migratory birds will winter in it.

His advice on the making of these bird refuges is founded on the great teacher Experience. He says in his book, Jack Miner and the Birds:

> A sanctuary where one expects to entertain water-fowl should, of course, be quite a large area of land and water . . . and a natural marsh is, of course, the proper place. But a sanctuary for the non-water birds can be made anywhere in the country or suburbs of a town; possibly a ravine with a small stream running through it would be preferable. A great many sites can be chosen where the trees and shrubbery are already grown. Personally, I prefer growing my own trees, it is such a pleasure. Five acres makes a nice sanctuary.
>
> If you contemplate planting one, first summer—fallow the land for one year. Plant evergreen trees, seven feet apart, eight rods width all around the outside, leaving twelve to fifteen rods square in the centre. Here you will build your feed-racks and feed-bungalows. Set this out with all kinds of fruit-bearing shrubs and vines. Now, with a dog-and-cat-proof fence around the outside, your eyes will be opened as to what you can do with the birds.
>
> "Oh, but how can we get the birds to come?" is the great cry. Please leave this to the birds. Just build the sanctuary and let them come to you to be taken care of.

THE GREAT FIRE OF LONDON

From Evelyn's Diary

A VERY valuable habit to encourage is that of turning into enjoyment the trivial things of every day. And those happenings which have given most enjoyment or interest to the day would seem the greater and would be stamped more deeply on the memory if daily or at least frequently expressed in writing. The diaries of most of us might be stupid reading for the world, but you never can tell.

In the seventeenth century, two Englishmen who led no very eventful lives recorded these trivial things of every day; the Diary of Samuel Pepys and Evelyn's Diary have passed into English literature and given us an intimate picture of English life in the seventeenth century. At least one great event Evelyn had to record, the great fire of London, of which we read on page 1980. Here is the story told by an eye-witness. Incidentally it is interesting to see how England looked in her garb of some 350 years ago.

"I went this morning on foote from White-hall as far as London Bridge, thro' the late Fleete Street, Ludgate Hill, by St. Paules, Cheapside, Exchange, Bishopsgate, Aldersgate, and out to Moorefields, thence thro' Cornehill, etc. with extraordinary difficulty, clambering over heaps of yet smoking rubbish, and frequently mistaking where I was. The ground under my feete so hot, that it even burnt the soles of my shoes. In the mean time his Majesty got to the Tower by water, to demolish the houses about the graff, which being built intirely about it, had they taken fire and attacked the White Tower where the magazine of powder lay, would undoubtedly not only have beaten downe and destroyed all the bridge, but sunke and torne the vessells in the river, and rendered the demolition beyond all expression for several miles about the countrey.

"At my returne I was infinitely concerned to find that goodly Church St. Paules now a sad ruine, and that beautifull portico (for structure comparable to any in Europe, as not long before repair'd by the late King), now rent in pieces, flakes of vast stone split asunder, and nothing remaining intire but the inscription in the architrave, shewing by whom it was built, which had not one letter of it defac'd. It was astonishing to see what immense stones the heate had in a manner calcin'd, so that all the ornaments, columnes, freezes, capitals, and projectures of massie Portland stone flew off, even to the very roofe, where a sheet of lead covering a great space (no lesse than six akers by measure) was totally mealted; the ruines of the vaulted roofs falling broke into St. Faith's, which being fill'd with the magazines of bookes belonging to the Stationers, and carried thither for safety, they were all consum'd, burning for a week following.

"It is observable that the lead over the altar at the East end was untouch'd, and among the divers monuments, the body of one Bishop remain'd intire. Thus lay in ashes that most venerable Church, one of the most ancient pieces of early piety in the Christian world, besides neere 100 more. The lead, yron works, bells, plate, etc. mealted; the exquisitely wrought Mercers' Chapell, the sumptuous Exchange, the august fabriq of Christ Church, all the rest of the Companies' Halls, splendid buildings, arches, enteries, all in dust; the fountaines dried up and ruin'd, whilst the very waters remain'd boiling; the voragos of subterranean cellars, wells, and dungeons, formerely warehouses, still burning in stench and dark clouds of smoke, so that in five or six miles traversing about, I did not see one loade of timber unconsum'd, nor many stones but what were calcin'd white as snow. The people who now walk'd about the ruines appear'd like men in some dismal desart, or rather in some greate city laid waste by a cruel enemy; to which was added the stench that came from some poor creatures bodies, beds, and other combustible goods. . . . Nor was I yet able to passe through any of the narrower streetes, but kept the widest; the ground and aire, smoake and fiery vapour, continu'd so intense that my haire was almost sing'd, and my feete unsufferably surbated. The bie lanes and narrower streets were quite fill'd up with rubbish, nor could one have possibly knowne where he was, but by the ruines of some Church or Hall, that had some remarkable tower or pinnacle remaining. I then went towards Islington and Highgate, where one might have seene 200,000

people of all ranks and degrees dispers'd and lying along by their heapes of what they could save from the fire, deploring their losse, and tho' ready to perish for hunger and destitution, yet not asking one pennie for reliefe, which to me appear'd a stranger sight than any I had yet beheld."

WHY THE ELM TREE GROWS SO TALL

WHEN at last the gods were satisfied with the sacrifice which Agamemnon had offered, the wind rose slowly, filling the sails of the waiting ships, and the impatient Greeks set sail for Troy. They were eager to avenge a wrong (of which we read on page 1983) and to measure their strength against the Trojans. But, alas! the Delphic oracle had foretold that the first to land must be at once slain; so that when the fleet reached the shores of Troy no one was willing to be the first to land. At last Protesilaus proved himself the bravest warrior of them all, for in disgust for the lack of resolution on the part of his comrades, and with a true willingness to offer himself in sacrifice, he was the first to spring ashore. Nor was the prophecy false, for he was immediately slain by Hector.

Now Protesilaus had left behind him, in the fair vale of Thessaly, a lovely and loving wife, who, when she heard of her husband's fate, all but died of grief. In her sorrow she made a piteous prayer to Jove to bring back her beloved from the realms of the dead. Had not Alcestis indeed, through the valor of Hercules, been rescued from death and restored to her husband for whom she had given her life? So might her beloved come back to her in mortal form, else she must herself suffer death that she might be with him. In her grief she prayed that he might come, if only for a moment, not thinking he might not come to stay.

So moved was the god by her surpassing grief that he yielded to her entreaty and sent winged Mercury to conduct her husband back to tarry with her, but only for three hours. Laodamia wept for joy at the sight of her beloved. The poet Wordsworth has quite beautifully told the story:

Forth sprang the impassioned Queen her Lord to clasp;
Again that consummation she essayed;
But unsubstantial Form eludes her grasp
As often as that eager grasp was made.
The Phantom parts—but parts to re-unite,
And re-assume his place before her sight.

"Protesilaus, lo! thy guide is gone!
Confirm, I pray, the vision with thy voice:
This is our palace—yonder is thy throne;
Speak, and the floor thou tread'st on will rejoice.
Not to appal me have the gods bestowed
This precious boon; and blest a sad abode."

"Great Jove, Laodamia! doth not leave
His gifts imperfect: Spectre though I be,
I am not sent to scare thee or deceive;
But in reward of thy fidelity.
And something also did my worth obtain;
For fearless virtue bringeth boundless gain.

"Thou knowest, the Delphic oracle foretold
That the first Greek who touched the Trojan strand
Should die; but me the threat could not withhold;
A generous cause a victim did demand;
And forth I leapt upon the sandy plain;
A self-devoted chief, by Hector slain."

He tells her how, while still upon the sea, he resolved that if no worthier led the way, his of a thousand vessels should be the foremost prow to touch the land, his the first blood to stain the Trojan sand.

In their blessed reunion the hours passed as moments when

Aloud she shrieked! for Hermes reappears!
Bound the dear Shade she would have clung —'tis vain:
The hours are past—too brief had they been years;
And him no mortal effort can detain.
Swift, toward the realms that know not earthly day,
He through the portal takes his silent way,
And on the palace floor a lifeless corse she lay.

The same grave, it is said, was the resting-place of this devoted pair, for the gods approve the depth and not the tumult of the soul, so says the poet. Upon their grave the gladsome nymphs planted elm trees which grew so high that they commanded a view of Troy, which sight caused them to wither. But where the nymphs planted these, new elms grew ever.

From out the tomb of him for whom she died
And ever, when such stature they had gained
That Ilium's walls were subject to their view,
The trees' tall summits withered at the sight;
A constant interchange of growth and blight.
Now you know why the elm tree grows so tall.

THE NEXT STORIES ARE ON PAGE 2957.

Humayun.

Native Soldiers of India.

Shah Jehan.

Akbar Khan.

Aurungzebe.

HOW INDIA BECAME AN EMPIRE

CONTINUED FROM 2702

THE story of India begins a long, long time before the story of England. For the first person who wrote down anything about England was Julius Cæsar, and that was only about fifty years before Christ was born—not quite two thousand years ago. But we know something about the people in India two thousand years before that. It was before Moses led the children of Israel out of Egypt, before even Abraham was born, that a people who spoke an Aryan language conquered the northern part of India. Learned people have found out that the languages which are spoken in Europe have grown up by degrees from one original language which was spoken ages ago by the ancestors of all these peoples. All the languages which have grown up from that one are called Aryan; so, because the people who conquered India more than four thousand years ago spoke an Aryan language, we know that they came from the same stock as the races of Europe.

Now, the races who peopled India before talked quite a different kind of language. When the Aryans came into India through the mountain passes of the northwest, they did not destroy these people utterly, but made some of them servants or slaves; while the rest fled before them into the hilly country, which was more difficult to conquer than the great plains, just as the Britons in England were driven into the hills of Wales by the Angles and Saxons. The Aryans made themselves lords of all the rich lands of Hindustan, keeping many of the old inhabitants as slaves, hewers of wood, and drawers of water, like the children of Gibeon. That is how those four castes grew up of which we read on page 2702. Three of these were the castes of the Aryan conquerors, which included the Brahmins, to whom belonged the priests and the men of learning, the warriors, who were called Rajputs, and those people who followed employments which were held less honorable than these. The fourth caste consisted of the conquered people, who were accounted altogether contemptible.

Moreover, by degrees the Aryans made conquest of most part even of the hill countries, yet not so completely as in the great river-basins of the Indus and the Ganges; so that instead of making the people slaves, they became mixed with them. That is why in the south there are far fewer Brahmins or Rajputs of pure blood than in the country to the north.

Because it was no easy matter for invaders to make their way into India,

great kingdoms grew up in Hindustan and in the Deccan, which had little enough to do with the world beyond the mountain barrier, their people knowing hardly anything of the great empires of Babylon and Assyria and Egypt.

Long before Homer sang the tale of the fall of Troy, long before Romulus raised the first earthen rampart of Rome, Indian singers were telling the great deeds of their heroes, and Indian law-givers were shaping the laws of the Hindus. This we know, because their poems and their law books have come down to our own time, and learned men study them even to this day. Of their law-givers, the most famous is Manu.

How the Persians and the Greeks came down upon India

Now, it would seem that when the Persian Empire was at its mightiest, just before King Darius made war upon the Greeks, the Persians made their way into India, and caused the kings of the Punjab—which means the land of the Five Rivers that flow into the Indus—to pay tribute; so that strange tales of the Indians came to the Greeks, of which this at least was true, that they would not eat flesh. But it was not till another hundred and fifty years had passed that the Greeks themselves were led by the mighty conqueror, Alexander the Great, through the great mountain passes. When they came into the Punjab, they were met in battle by the valiant Indian prince who was called Porus; though it would seem that this was not his own name, but a title borne by all those princes, just as all the kings of Egypt were called Pharaoh. In that battle, Porus was overthrown, so that Alexander made himself lord of all the Punjab; but because Porus was a wise man and valiant, Alexander made friends with him, and gave him back his kingdom, though he was still subject to the Greeks.

How Alexander's empire broke up and a great ruler rose in India

Some few of the Greeks abode in the Punjab, for some of their coins and their carvings have been found there; but after the empire of Alexander was divided, the veil fell again between the East and the West, and the nations of India went their own way as before. Moreover, it was only the peoples of the Punjab that were ever reached even by the Greeks. In those days there arose in Hindustan a very great ruler whose name was Asoka, whose fame for justice and mercy was spread over all India. He became lord of nearly all Hindustan, and even far away south in the Deccan his name was revered. Moreover, under his rule the doctrines of the great teacher, whom men for the most part call Buddha, but who had many names, were spread abroad, and many Buddhist temples arose. But of Buddha himself, who lived long before Asoka, we read in another place.

Now, for nearly a thousand years there is little more that need be told, except that men say that there were disciples of Jesus who made their way to India and preached the Gospel there; yet there were but few who believed. And again the teaching of Buddhism became corrupt, and the old religion took its place again, though this, too, had become changed and corrupt. This is the religion called Hinduism, which is followed by three-fourths of the people of India even to this day.

How Mussulman conquerors poured into Hindustan and set up kingdoms

Then there came a change, for when Mohammed had begun to teach the new faith which is called Islam, his successors set forth to compel all men either to become Mussulmans themselves, or the subjects of Mussulmans; and before long some of the Arabs, or Saracens, invaded India. However, it was not till Mohammed had been dead for nearly four hundred years—a thousand years after the birth of Christ—that Mussulman conquerors began to pour into India at the head of great armies, and to set up kingdoms in Hindustan, where Mussulman kings, with armies of Mussulmans, ruled over Hindu subjects. The first of these was called Mahmud of Ghazni, who conquered all the north of Hindustan with soldiers from Afghanistan beyond the mountains. And after this there were many Afghan and Pathan rulers, and Turks also, who reigned at Delhi, and others who set up kingdoms in the south, whom the Hindus hated as foreign conquerors; but because the Mussulmans were for the most part soldiers, they generally won the mastery.

At last, when Henry VIII was king of England, Hindustan was invaded by Babar, founder of the Mogul Empire. So valiant and daring a warrior was he

THE OLD AND NEW RULERS OF INDIA

This picture shows an English ambassador's first visit to a ruler of India. England first went to India by sea, and at the time of the rise of England's sea power, Elizabeth sent Sir John Mildenhall in 1599 to Akbar, the Great Mogul, to apply for trading privileges for a company to which she wished to give a charter.

This picture helps us to understand the vast change that has come over India. For two hundred and fifty years British influence grew in India, but the country was still under the sway of native rulers until near our own time. To-day the King of England is Emperor of India, too; and in India King George V is called Emperor George. Many years ago King Edward VII visited India when he was Prince of Wales, and this picture shows his meeting with some of the native princes of India.

that with an army of 12,000 men he overthrew the greatest kings of Hindustan, in all their might, both Mussulmans and Hindus.

THE FOUNDING OF THE MOGUL EMPIRE, AND THE GREAT KING AKBAR

After him, his son Humayun had troublous times, and was driven out of the land, but had almost made himself king again when he died. But Humayun's son Akbar was one of the most famous and the greatest of all kings, for he was not only so great a warrior that he brought all Hindustan under his sway from the mountains on the west to the ocean on the east, but his rule also was exceedingly wise. He did not seek, as most kings did in India, to rule by the sword and oppress the people, but resolved to extend equal justice to all, whether Hindus or Mussulmans. He began to rule two years before Queen Elizabeth, and his reign lasted for fifty years, so that he outlived her for a little time; and when he died he left a greater empire, stronger and better governed, than India had known since the days of Asoka.

In his days, and in those of his son Jehan Gir, there came to India travelers from Europe, who brought home wonderful tales of the splendor of the court of the Great Mogul. There even came to Jehan Gir an ambassador from King James I, Sir Thomas Roe, seeking his friendship. But Jehan Gir brought little good to India, for he cared only for his own pleasures and not for the good of the people over whom he ruled. A much better emperor was his son, Shah Jehan, who built the famous Taj Mahal as a memorial of the wife he loved, as we have read on page 2701.

HOW THE RULE OF INDIA PASSED INTO THE HANDS OF THE BRITISH

After him, his son Aurungzebe ruled for nearly fifty years, and strove to bring all India under his sway, overthrowing the great kingdoms that were still in the Deccan; yet thereby he wrought the ruin of the empire, since it became too large to be held under control; so it had to be divided into great provinces. And after his day the ruler of each province cared little enough for the Great Mogul at Delhi, but went each his own way as if he had been an independent king under no control.

And so it fell out that the lordship of India passed away both from Hindus and Mussulmans, who were somewhat akin in spite of all their differences, into the hands of the British, who were not akin at all in race or manners or religion, though they were descended from the same stock from which the Brahmins and Rajputs had sprung more than four thousand years ago.

Just before Babar conquered Hindustan, the Portuguese had found that they could sail to India round the south of Africa; and they took possession of some harbors on the Persian Gulf and on the coast of India and in the islands to the southeast, and began to trade there. Then, a hundred years later, King Philip of Spain made himself king of Portugal; and since he was at war with the English and the Dutch, both of them were ready to try and get all his trade into their own hands. So just before Queen Elizabeth died, the English and Dutch each set up a company to trade with the Indies.

THE FACTORIES WHICH BROUGHT ABOUT THE NEW TIMES IN INDIA

Then the English persuaded first one and then another of the native rulers, who were the subjects of the Great Mogul, to let them set up a trading station, which was called a "factory," at Surat, and at Madras, and at Calcutta. When Portugal freed herself from Spain, King Charles II married a Portuguese princess, and the Portuguese gave him Bombay, of which city they had gained possession in the old days. The French, too, following the example of the English, got permission to set up factories at Pondicherry, which is not far from Madras, and at Chandernagore, which is not far from Calcutta. All of which things befell while the Great Moguls were still mighty, before Aurungzebe died.

Then, just when the Mogul Empire was breaking up into a number of provinces, which were really independent kingdoms, there arose a great rivalry between the British and the French, each of them seeking to win favor with the native princes, so that they might secure all the best of the trade, and shut the others out. As the disorder grew greater within the empire of the Moguls, and as it also seemed likely that Great Britain and France would go to war with each other over quarrels that they had

NATIVES OF INDIA AND THEIR RULERS

A YOUNG RAJAH, OR PRINCE, OF INDIA

A MAHARAJAH, OR GREAT PRINCE, OF INDIA

A MOHAMMEDAN AT PRAYERS

A FARMER AND A WARRIOR

There are many kinds of people in India, and the hill peoples differ widely from the people of the lowlands. The rulers lived in great magnificence and wielded great power before the British ruled the country. Their costumes, and those of the people, are very picturesque, and a man's rank or occupation is indicated by his dress. As a consequence the markets and streets in India look very interesting.

in other parts of the world, a very clever Frenchman in India, whose name was François Dupleix, thought that he might manage to turn the British out of their trading factories.

THE FRENCHMAN WHO TRIED TO CONQUER INDIA FOR FRANCE

Nobody thought about conquering India, but Dupleix thought that if the British were out of the way, the French would be able to make themselves so useful to anyone they chose to help in the quarrels that were likely to arise more and more frequently among the native rulers, that they would soon be able to get very nearly anything they might ask for. He was the more sure of this because he saw that French troops could fight much better than the native armies, and he thought that if native soldiers were trained and commanded by French officers they would be nearly as good as French troops.

So when the expected war between Great Britain and France broke out, Dupleix attacked the British at Madras and captured it. Then the ruler of that part of India, who was called the Nawab of the Carnatic, wanted to turn the French out of Madras, and Dupleix had the chance of showing that his idea about training native troops under French officers was right. He did it, too, for a mere handful of men scattered quite a large army which the Nawab sent against them. The French had to give Madras back after all, because when the war came to an end both sides gave back what they had taken; but then, as Dupleix had expected, native rulers began to quarrel, and one side made haste to ask the French to help them. Then of course the British took the other side in the quarrel.

THE CLERK WHO DROVE THE FRENCH ARMY OUT OF INDIA

This time the fortune of war went against the French, for while the French and their allies seemed to be getting the better of the allies of the British, a daring young officer named Robert Clive —who had joined the army at the end of the last fighting, having been only a clerk before that—was sent with a few hundred sepoys, or native soldiers, and a very few British volunteers to attack the enemy's capital, which was called Arcot. Clive captured Arcot, and then, with his few men, defended it so stoutly against a great army that presently he put that army to utter rout. After that the British and their allies got the best of it. Although peace was again made in India, before long yet another war broke out between Great Britain and France, and this time the British beat the French so thoroughly that they had to promise not to keep soldiers in India any more.

So instead of the French getting rid of the British, as Dupleix had hoped, the British got rid of the French, and could carry out the plans which Dupleix had meant the French to carry out for themselves. The French taught the British how to make themselves powerful in India, and the British learned the lesson well.

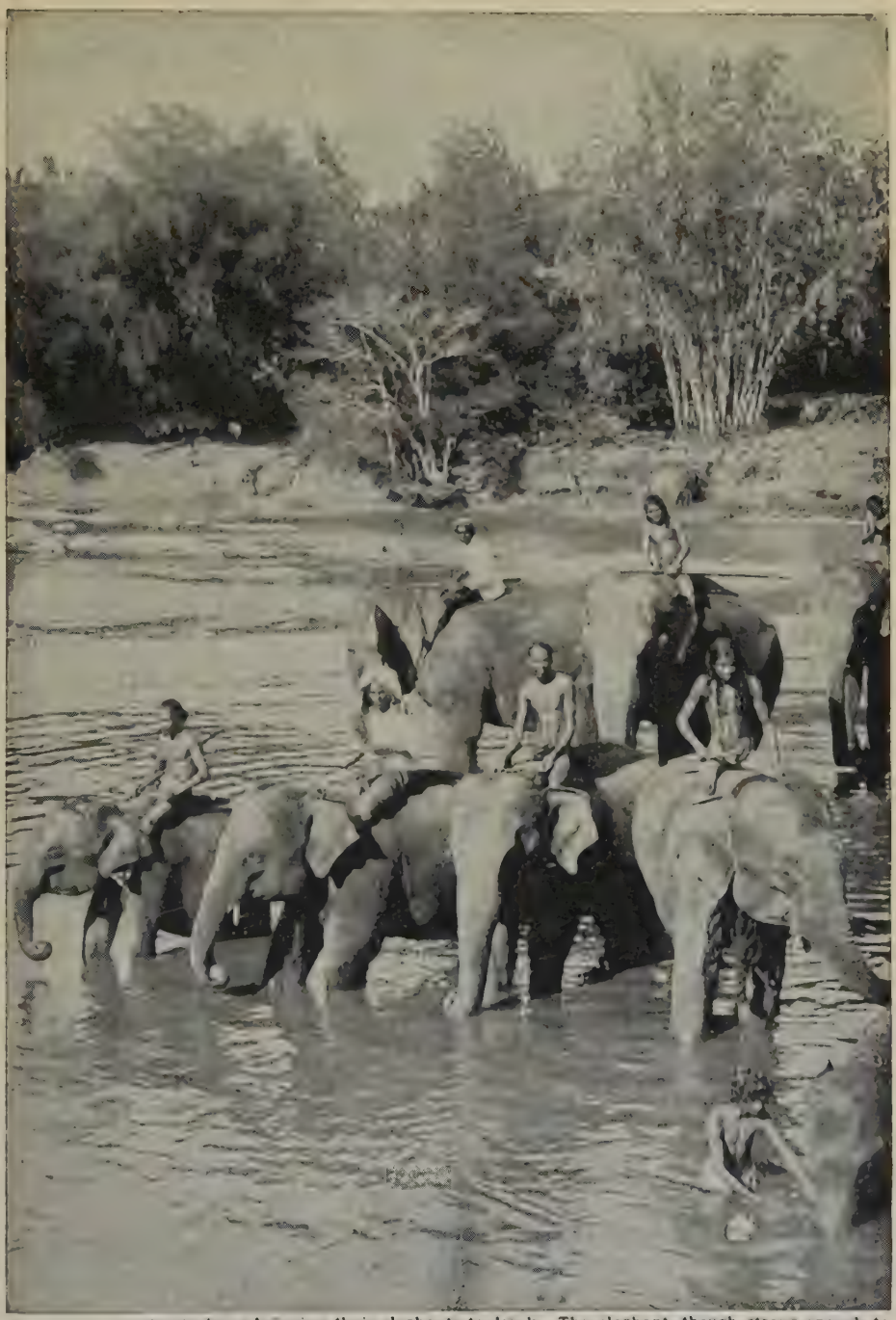
Before the French had been quite got rid of, another thing happened, which made the British masters of the very important province of Bengal.

THE CRUEL RULER WHO SHUT UP PEOPLE IN THE BLACK HOLE OF CALCUTTA

The ruler of Bengal, like the ruler of the Carnatic, was called the Nawab; and his name was Surajah Dowlah. He was very silly and very cruel. Because he was offended with something that the British people at Calcutta had done, he seized nearly a hundred and fifty of them, and shut them all up on a stifling hot night in a little room with only a tiny window, ever since called the Black Hole of Calcutta; and the result was that nearly all of them were dead before morning. Of course the British at Madras determined to punish the Nawab of Bengal for his crime; and Clive was sent off by sea with a few troops and some ships of the navy which happened to be at hand. He very soon routed the Nawab's soldiers, and took Calcutta again; and then a number of the native chiefs who had resolved to get rid of Surajah Dowlah asked Clive to help them.

Clive then marched against the Nawab with an army of three thousand men, and the Nawab marched against him with fifty thousand. At the famous battle of Plassey the three thousand routed the fifty thousand; Surajah Dowlah was killed; and then all the native chiefs made submission to Clive. Although he appointed a new Nawab, he had himself to become the real ruler of Bengal, and after a little

ELEPHANTS DRINKING IN THE SACRED GANGES



Here we see native trainers bringing their elephants to drink. The elephant, though strong enough to crush out a man's life with one of its huge feet, is very gentle and affectionate when treated kindly. A well-trained elephant will obey the slightest word or gesture of its driver, or mahout. The strength, the gentleness and sagacity of these tame elephants make them very valuable as beasts of burden.

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while the Great Mogul agreed that Bengal should belong to the British.

This was the first great territory to fall to the East India Company.

THE FIGHTS BETWEEN THE BRITISH AND THE NATIVE RULERS OF INDIA

In this way, although the British had not planned any such thing, they suddenly found that their trading company, with its few factories, had become ruler of a whole great province, while the Nawab of another great province, the Carnatic, had promised them obedience. The two provinces together were only a small part of India, as if a foreign power had become master of two or three small divisions of our country. But they were larger than any of the provinces ruled by a single native prince—except, of course, the Mogul, who was supposed to rule over all of them, including the British. Then the Government in England appointed a Governor-General for these new dominions—Warren Hastings—who has been very much blamed for some of his doings, and was impeached for them in Parliament, because people did not understand why he had acted as he did. Yet it was owing to him that a good and strong government was finally established at all.

Now, while the British were chiefly anxious to secure what they had won, and to establish a good government in those provinces, the native rulers made sure that they wanted to conquer more; besides which, two or three of the native rulers were anxious to enlarge their own territories, and perhaps to make themselves masters of all India, now that the Mogul's real power was so small; therefore they would have liked to turn the British out again.

It thus happened that three times in the course of twenty years the great southern state of Mysore defied the British, and a little later the people of Nepal, which is in the mountains along the north side of India, where they edge the plain of the Ganges, tried to take possession of part of the plain below them.

THE SPREAD OF BRITISH RULE OVER ALL INDIA, AND THE TERRIBLE MUTINY

So there was war with them, at the end of which they, too, gave up part of their lands; but the people there, who are called the Ghurkas, made friends with the English, and now the Ghurka regiments in the British army are some of the best regiments in the world. Then a number of princes of the race called Mahrattas made war with Great Britain, and from some of them also the greater part of their lands were taken away. Last of all, the Sikhs, who ruled in the Punjab—their name is pronounced *seek*—invaded British territories, and rose against the British, as Mysore had done, and when the war was over the British took possession of the Punjab. Then all India within the circle of the mountains and the sea was under their rule, though the princes who had not brought on the war were allowed to remain the lords of their realms, on condition that they did not rule as tyrants, or try to stir up wars. But in the year 1857 there came a terrible time, when the Sepoy regiments all along the Ganges plain mutinied against their officers and against British rule, the Mussulmans among them seeking to restore the old dominion of the Moguls. Where there were enough regiments of British soldiers, the mutiny was kept in check; but where there were many native regiments and few white soldiers, defense was difficult.

THE PEACE THAT CAME AFTER THE MUTINY, AND THE NEW EMPIRE

At Cawnpore, the leader of the rebels, Nana Sahib, promised to spare the British if they surrendered; but he broke his word and murdered them all. At Lucknow the garrison held out and endured through a long siege, till they were relieved, first by Havelock and Outram, and then by fresh troops from England led by Sir Colin Campbell. Because there was a great rising of mutineers at Delhi, where the Mogul was, a British force besieged the city and took it after a time. But after Sir Colin Campbell had arrived with his fresh troops, it was not very long before the revolt was crushed altogether.

After that the British nation said that it was time to end the ruling of India by a company of merchants, so the Queen of England ruled India. The aim of the British Government in recent years has been to spread education and ideas of wise and just government throughout India so that the people of India may be increasingly able to take an active part in the management of their affairs.

THE NEXT STORY OF ALL COUNTRIES IS ON PAGE 2929.

THE ROCKY HEIGHTS OVERLOOKING THE BANAS RIVER AT RAJMAHAL, IN JAIPUR

THE WIDE BUSPA VALLEY RUNNING BETWEEN THE SNOW-CAPPED PEAKS

THE MARKET PLACE AND PRINCIPAL STREET IN JAIPUR

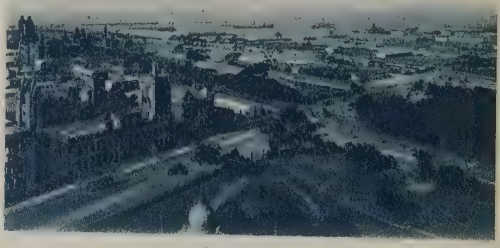
THE BAZAAR AT LAHORE

A STREET IN OLD DELHI

A STREET SCENE IN BOMBAY

SIMLA, THE TOWN IN THE HILLS

PONDICHERRY, CAPITAL OF FRENCH INDIA



THE HARBOR AT MADRAS

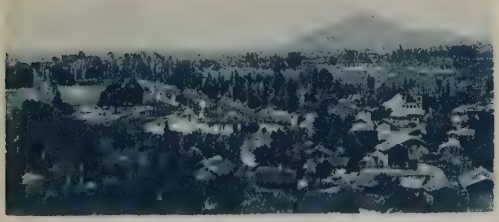
A PANORAMIC VIEW OF DELHI, THE NEW CAPITAL OF INDIA

THE FORT AND PALACE AT GWALIOR

A SHOPPING QUARTER IN CALCUTTA

A STREET IN PATAN, NEPAL

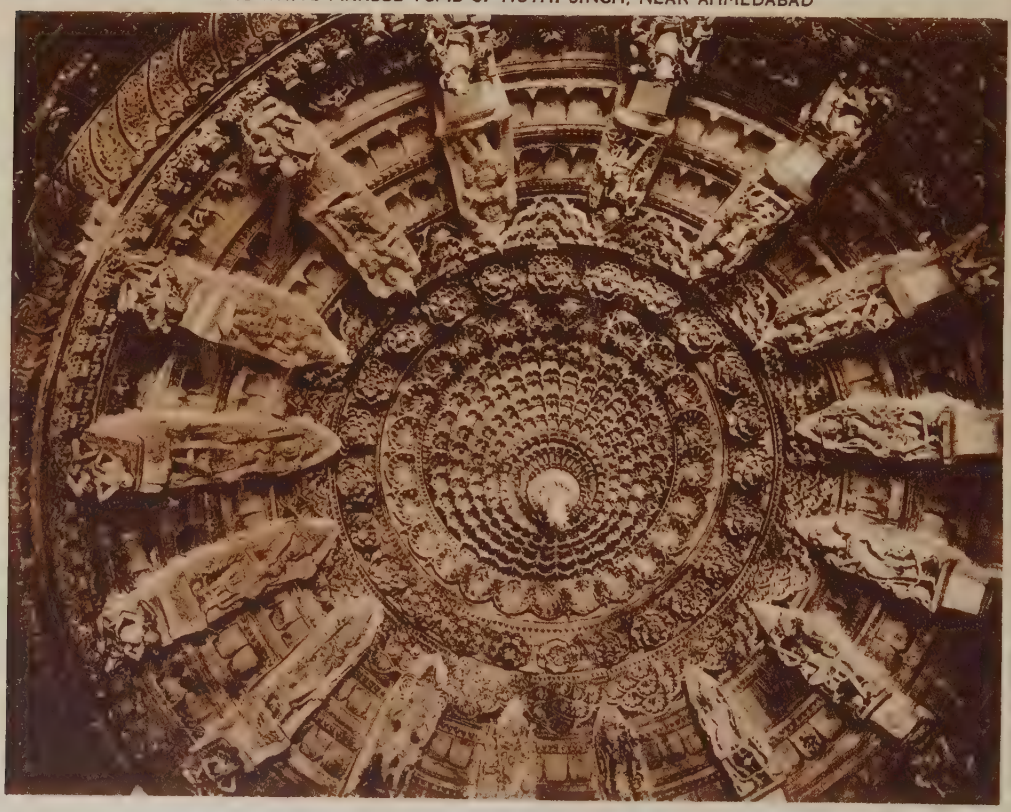
A BUSY STREET IN AGRA



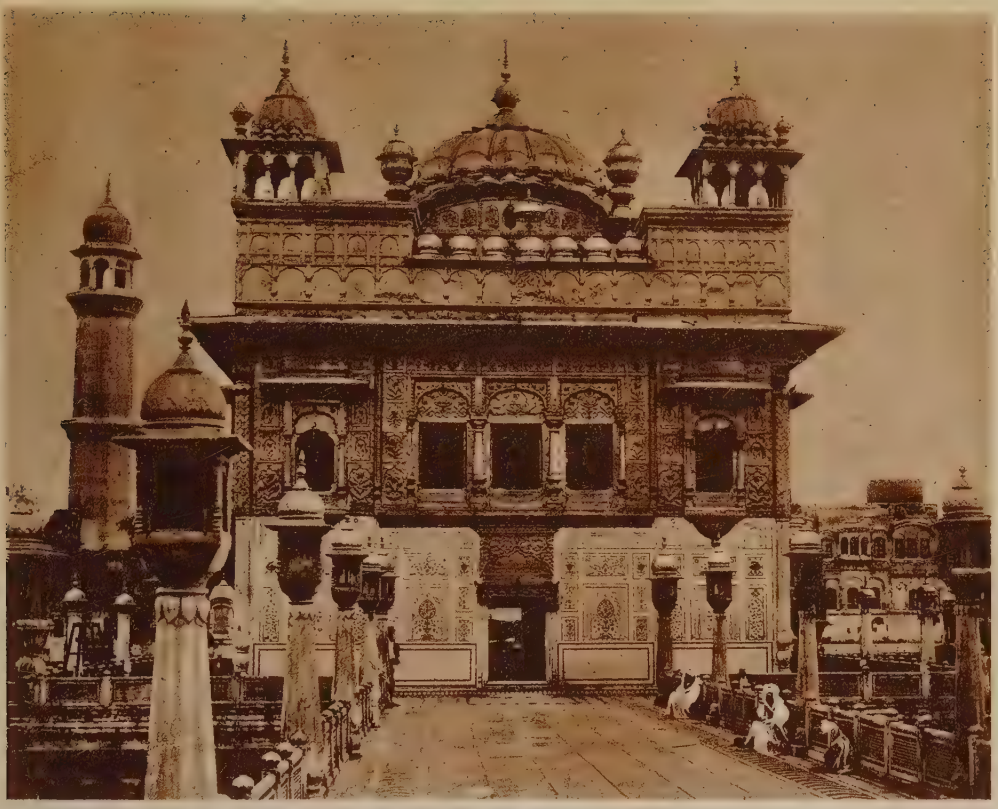
SRINAGAR, CAPITAL OF KASHMIR

THE CITY OF BENARES

THE WHITE MARBLE TOMB OF HUTHI SINGH, NEAR AHMEDABAD



A CEILING IN THE JAIN TEMPLE AT MOUNT ABU



THE GOLDEN TEMPLE AT AMRITSAR

THE CARVED PILLARS IN THE JAIN TEMPLE AT MOUNT ABU

THE PAINTED CORRIDOR IN THE GREAT TEMPLE AT MADURA

A WOMAN OF INDIA TAKES A WALK

AN INDIAN DANCING GIRL

A MAHRATTA MOTHER AND HER CHILD

ON AN ISLAND NEAR BOMBAY

INDIAN BOYS AT SCHOOL IN AMRITSAR

A HINDU WASHERMAN

A BEAUTY OF WESTERN INDIA

A NATIVE CHARMER OF SNAKES

A TEMPLE AT UMNABAD

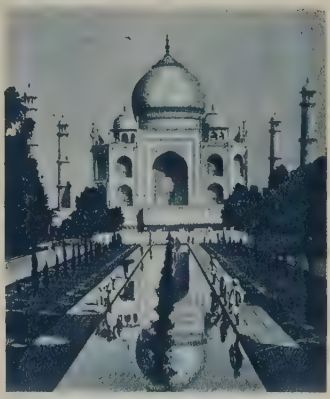
THE PRAYING TOWER AT DELHI

A TEMPLE AT UDAIPUR

ON THE RIVER JHELUM NEAR SOPOR, IN KASHMIR

THE MOSQUE OF AURUNGZEBE AT BENARES

A ROCKING-STONE SHRINE IN THE KELASA HILLS, BURMA



THE FAMOUS TAJ MAHAL NEAR AGRA

ALLIGATORS SUNNING THEMSELVES ON THE SHORES OF A LAKE

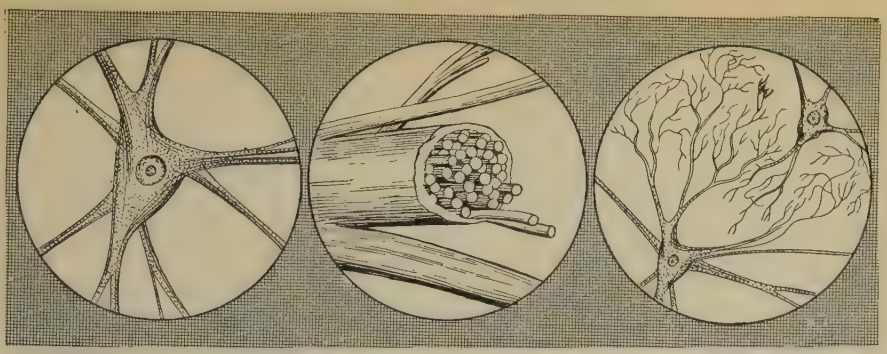
A HERD OF BUFFALOES ENJOYING A COOL NOONDAY DIP

GWALIOR STATE ELEPHANTS, WITH PAINTED FACES, TAKE A BATH IN THE RIVER

A CAMEL CART IN RAJPUTANA

A BULLOCK TEAM IN THE STREETS OF MADRAS

The pictures on these pages are by Messrs. Bourne & Shepherd, Herbert G. Ponting, E. W. S. Slater, and others



On the left is a nerve-cell, magnified. Its fibres may intertwine with those of another cell, as on the right, but they never unite. In the centre is a bundle of nerve-fibres with branches.

THE FOREST OF NERVES WITHIN US

CONTINUED FROM 2684

IF we feel gently at the back of the elbow, rather toward the inner side, we find a thing that feels like a sort of cord. If we knock it accidentally, we discover that it is what we call the "funny bone." It is a nerve, and therefore belongs to the most marvelous of all marvelous things. If we take a nerve and look at it we find it to be a cord made up of tiny fibres. These fibres are the real nerves. The big cord is simply a bundle of them traveling part of their journey together.

A nerve-fibre is probably not to be found anywhere in the vegetable world. Very low in the animal world we find them, and their importance and number become greater and greater as we ascend. There is no part of our body which has not nerves; and there is no part of the body which does not suffer in some way if the nerves running to it are damaged or cut.

When we examine a nerve-fibre we find that it is a very long thread, usually surrounded by a sheath containing a quantity of a special kind of fat. When we excite our "funny bone" by hitting it we feel a tingling in our fingers. We have excited the fibres which carry feeling along the nerve from the fingers to the brain. In other cases muscles will twitch. We have excited fibres which carry orders along the nerve from the brain to those muscles. This shows that nerves carry something. The nerve-fibre is therefore a conductor. It is like the wires in the cable. They do not make messages, but they carry them. What runs along the wire will run in either direction. It is probable that any particular nerve-fibre carries what it carries in only one direction.

The wire carries an electrical current. As long as the wire is not broken, and is properly insulated, the current will run. The wire is not alive, and though we do not understand what happens in it, there is not the same mystery which we find when we look at a nerve.

The noteworthy thing about a nerve is that it will carry what it carries only when it is alive. We can remove a piece of nerve from an animal that has been killed and can study it in various ways. If we keep it moist with water containing little salt, and if we keep it warm enough, it will live for quite a long time. As long as it is alive things that disturb one end of it will send something through it. When it dies it will no more carry messages than a piece of string will. What makes the difference between life and death in the nerve we cannot understand. We can see no change under the microscope to account for

the difference, for we have to kill the nerve in order to look at it under the microscope.

THE MYSTERY OF THE CURRENT THAT NO MAN CAN UNDERSTAND

The thing that runs along the nerve we call a nerve-current, or a nervous current. Current simply means something that runs, and that is really almost all we know about it. It is not the same as anything else in the world. It depends directly upon the life of the nerve, as we have seen.

It is not electricity. Curious changes are produced in a nerve when a nerve-current runs along it. Among these changes is the production of electrical currents of various kinds. An electrical change is produced in the nerve when a nerve-current runs along it, and the study of these electrical changes may help us to understand the nerve. It is a mistake, however, to suppose that the nerve-current is electrical. Nerve-currents travel at rates which, compared with the movement of electricity, are very slow. The rate of a nerve-current seems to be about the same as the rate at which a baseball can be thrown. An electrical current is hundreds of thousands of times faster.

Nothing seems to be used up in a nerve when it conveys a current, any more than in the case of a telegraph wire. So we cannot make a nerve tired. As long as it remains alive it will go on sending currents as often as we choose to start them.

The case of a nerve-cell is very different. Every nerve-fibre grows out of a nerve-cell. It is part of that cell. It is only the servant of the cell, carrying orders from it or messages to it. The real thing, where the greatest mystery lies, and upon which everything depends, is the nerve-cell.

THE NERVE-CELLS UPON WHICH ALL OUR FEELINGS DEPEND

When we study the development of the body we find that every nerve grows out of a cell. We find also that if a nerve is cut across, the part next to the cell is unhurt, but the part separated from the cell dies. We find also that, if a nerve-cell is destroyed or poisoned, the nerve-fibre running out from it invariably dies. If the nerve-cell has been actually killed, that nerve-fibre can never recover. So these "cable wires" are not merely alive, but are created by living cells, of which they are living parts.

A nerve-cell may have only one fibre coming from it or it may have several. Very frequently we find nerve-cells which have one fibre coming out from each end of them. The fibres from any nerve-cell are very often found going to meet the fibres from another nerve-cell. Suppose, then, we can trace a nerve-fibre from a cell somewhere in the brain, and we find that it meets another fibre from another cell, perhaps at some other place in the brain. Do the two fibres run into each other? Careful study shows that the fibres never do run into each other. But at their extreme ends they break up into tiny fingers, so to speak, and the fingers of the two fibres will interlace. If we study parts of the brain where many nerve-cells and nerve-fibres exist together, we find that it is like a dense forest. Their leaves and branches intermingle with each other in the closest possible way, but never join.

All this is very important because it teaches us that, as a gas is made of atoms, as the body itself is made of cells, so the nervous system is made up of true units which are also cells. Though these cells are of a peculiar kind, and produce fibres which may run right away from the body of the cell for inches or even feet, yet each cell remains a true unit.

WHAT THE SIMPLE BRAIN OF A BEE OR WASP IS LIKE

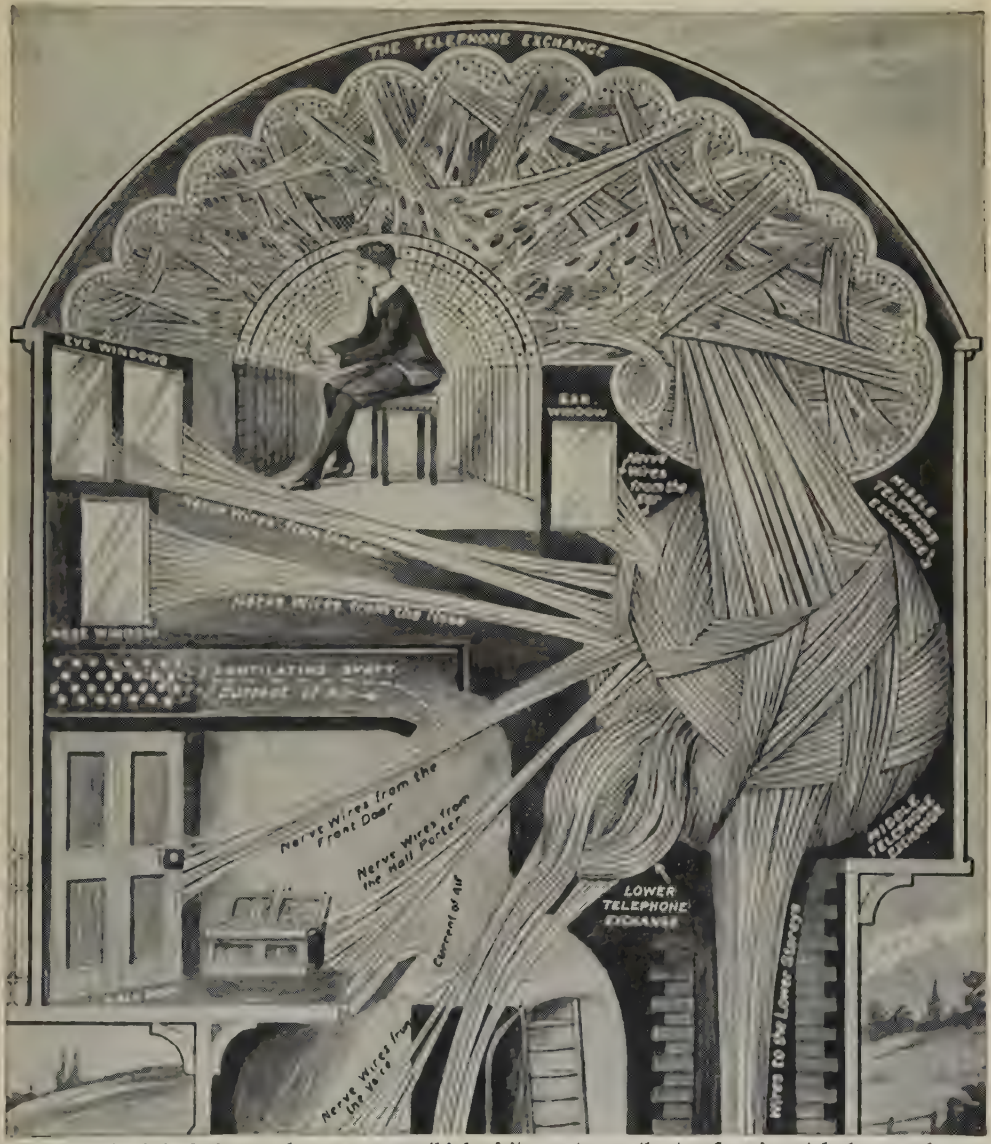
In the very lowest animals that have nerve-cells and nerves the number is very few, and the arrangement very simple. They are usually arranged merely to carry feeling from the outside of the animal to its inside. But as we ascend the scale of life nerve-cells and nerves are more numerous, and often numbers of them get bunched together into little balls, each a sort of nervous centre, perhaps somewhat like a telephone exchange.

When these collections of nerve-cells become very large they make a thing that we can only call a brain, and such is the brain of a bee or a wasp, for instance. The whole arrangement of nerve-cells and nerve-fibres is called a nervous system.

When we study animals with backbones we find new nerve-cells and nerve-fibres. The central home of this new nervous system is inside the backbone. The old nervous system, such as insects have, remains, and communications are established between the old and the new.

In all animals that have back-

bones both these nervous systems are found. We may say roughly that while the old one looks after the interior life of the body, it is the new nervous system that is the instrument of the mind. At what is often called the central nervous system. Through holes in the skull and through openings in the backbone run nerves which connect the central nervous system with every part of the body.



If we think of the body as a house, we may think of its master on the top floor in a telephone exchange from which the nerves run out to all parts of the body. From the brain the nerves run everywhere—to the eyes for seeing, to the nose for smelling and breathing, to the mouth for taste, and so on.

its upper end the long tube inside the backbone opens out into the hollow skull; and in the same way the nervous matter found in the backbone, which we call the spinal cord, becomes enlarged and forms the brain.

The brain and the spinal cord form

It seems quite clear that whether we take the group of cells that form a mere hair or any other part of the body, we always find that it has a double connection with the central nervous system. The brain or the spinal cord, or both, can send to it messages on which its

life depends. On the other hand, it can send messages to them.

When we come to study the central nervous system we find it so arranged that every part of the body is really in true communication, when necessary, with every other part. It is this amazing fact that helps to explain how the body becomes a whole in spite of the infinite variety and number of its parts. In no city on earth is there any arrangement a thousandth part as wonderful as the arrangement by which the nervous system connects all the parts of the human body.

THE MAZE OF NERVES RUNNING TO AND FROM EVERY PART

We have already learned what is necessary regarding nerves. The lining of the heart, the wall of a vein, the base of a nail, every muscle-fibre, and all other parts of the body are doubly connected by nerves with the central nervous system. We do not need to inquire how and where these nerves run, though, of course, the doctor has to spend months and years in studying this. We must devote ourselves now to the central nervous system, and especially to the brain.

We saw when we were studying alcohol that the central nervous system consists, in a way, of a number of layers. As the bodies of the animals we study are more and more wonderful, we find new layers piled up on the older ones. Each new layer is, we may say, the master of all the layers below it. It is in this way that we can come to understand the working of the brain and the spinal cord.

THE SPINAL CORD, WHICH ACTS AS BUTLER TO THE BRAIN

The spinal cord is old, so to speak. Its business nowadays is to attend to things which are beneath the notice of the brain, as, for instance, the movements of the stomach and that kind of thing. It is a sort of highly trusted and responsible butler in the house of Man. Like other butlers, it not only looks after a great many small matters on its own account, so as not to trouble the master, but it is also the master's means of communication. As a rule the master gives orders to the butler, and the butler does the rest. On the other hand, when delivery boys have anything to say, they do not go to the master, but interview the butler, and he takes the message to the master. So also does the spinal cord.

When I close my hand, the brain which gave the order did not speak directly to the muscles. No nerve-fibres run directly from my brain to the muscles of my hand, but nerve-fibres do run from my brain to the spinal cord, which is my butler. They give orders to certain nerve-cells in the spinal cord. From those nerve-cells fibres go to the muscles of my hand. In the same way, when I feel a draft on my skin the nerves from my skin do not run direct to my brain. They run to cells in the spinal cord, from which communication is made to my brain.

If we cut across the spinal cord, and take a very thin slice of it and stain it with dyes that will show up the way it is made, we find that its structure exactly corresponds with its duties. We find in it fibres and cells. Some of these fibres are running to the brain, some from the brain. Many of them arise from cells in the spinal cord and run to other parts of the cord and end there. If we think of the spinal cord as the telephone exchange of a big office, these fibres are like the private wires that do not come from, or go to, the outer world, but connect one part of the office with another.

THE SKULL IN WHICH THE CENTRAL NERVOUS SYSTEM IS KEPT

The usefulness of the spinal cord depends largely on the proper working of these beautiful arrangements which keep every part of it informed as to what every other part is doing, and enable the different parts to act in harmony.

The diagram on page 2841 shows us the central nervous system as it appears without the wonderful box, as we may call the skull and backbone, which exists to protect it. We see that at its upper end the spinal cord becomes slightly thicker so as to form what we might call a bulb. That, in fact, is one of the names for this part of the brain. It contains the group of nerve-cells which controls our breathing, and its destruction means instant death. It contains, also, another group of nerve-cells which controls the heart; another group which controls the size of the blood-vessels; another for the acts of sucking and swallowing; another which controls perspiration; and there are probably more. All these are contained in a little portion of nervous tissue about the size of the end of the thumb. It is often called the *medulla oblongata*. Above the bulb things be-

come complicated. If we had to begin with the grown-up human brain we should never find the key to it; but if we study the brain as it develops, the thing becomes clear. We see that what is the lower part of the brain in us, all huddled and squeezed together and completely poked out of sight by something else that has grown over it, is the old brain, "the first brain that ever was," so to speak. It contains innumerable nerve-cells, arranged in groups with different duties. It is concerned chiefly with movements of the body. In lower animals it is also the place where hearing, seeing and feeling are done. In ourselves we know that some of these senses have become so delicate and wonderful that they require new machinery. The old centres which are good enough for lower animals are in us only halfway houses toward the brain in man.

Behind the old brain is a large and important piece of nervous tissue with a name really meaning "little brain." It is called the *cerebellum*, and it gets larger and larger in higher forms of life. We do not hear or see there; it starts no movements; and certainly the will and the powers of thinking do not live there. We find that it is a great instrument for making the body do what we want. The power of balancing the body lives there. A drunken man staggers because he has poisoned his cerebellum. Also the balanced use of the muscles for complicated and delicate actions, like painting or playing the violin, depends on the control of the cerebellum. It may be thought that these duties are not very exalted, and we may wonder, therefore, why the cerebellum should get bigger. But we have already learned that we can move things, our bodies and things outside them. Through this power of movement, and only through it, our minds can live and act. So it is very important that our control of movement should be as finely adjusted as possible.

The nerves run through the body like telegraph wires. The strong white line is the spinal cord.

As we pass upward in the scale of life we find that with the growth of the cerebellum and the development of skill there comes a time when the mouth, that dogs and cats and lions and sea-lions are so clever in using, is not a good enough instrument for the highest and most complex kind of brain.

Something better is required, and we find that the animals called lemurs, a very ancient kind of monkey, use their hands a little for grasping as well as walking, though they prefer to use their mouths, as anyone can see who feeds them at the zoo. When we reach the highest apes we see that they find and examine, and lift their food with their hands, and then carry it to their mouths. The arms now come to have special purposes of their own, and every finger becomes precious.

Man, after crawling babyhood is past, does not use his fore limbs for locomotion. He learns how to use every one of his fingers separately, as with the typewriter or the piano. Thus there has been an immense development of skill in man —though mere strength has decidedly fallen off—and therefore a great development of the cerebellum.

This is very interesting, because it helps us not only to understand the brain, but also to understand children. Children belong to a race that lives in the world by its cleverness of all kinds, and so they like to practice their skill. This is why children love games of skill. This is why children have always been fond of balls. Play is really an essential part of the work of a child.

Those people who find fault with children for liking to play, and say that they ought to be doing useful things, are really ignorant. They do not realize that the most useful thing a child can do is to play. All of this proper play will be of great use to them in after-life. It is practice for the work they must do.

THE NEXT STORY OF OUR OWN LIFE IS ON PAGE 2943.

COLUMBA'S FIRST SIGHT OF SCOTLAND

This beautiful picture shows Columba sighting the shores of Scotland at the end of his voyage across the stormy seas which rage to the north of Ireland, where Columba lived. He went over to Great Britain with the Gospel more than thirty years before St. Augustine landed in Kent. This time Christianity, which had almost died out after being introduced by the Romans, came to stay and to revolutionize the lives of both the people and their rulers. Columba founded a monastery on the island of Iona, and from that place he sent out his followers to preach the Gospel to the dwellers in the northern half of Great Britain. We can still see the ruins of his monastery, where he lies buried. This picture was painted by Georges Girardot.

The newly crowned king, Edgar the Peaceable, bids his vassal kings cease rowing, that he may hear the chanting of the monks, across the waters of the Dee, from the minster of St. John.

EARLY LEADERS OF THE CHURCH

CONTINUED FROM 2730

IN the early days of Christianity the Christians were persecuted by the rulers of the great Roman Empire, who imagined that the new teaching would persuade people that they might destroy the laws. But after a time all that was changed; Christianity became the most favored religion in the empire.

That meant that the clergy—that is, the people who gave themselves up to the service of the Church, to praying, preaching and teaching; people who were appointed to this particular kind of work, in the particular way ordered by the rules which the Christians had made for themselves in early times—soon came to have a great deal of influence. Pious people gave them money and lands, so that they might build noble churches and cathedrals, and might use their wealth, both in helping the poor and oppressed and in spreading Christianity among the heathen.

The clergy—a separate folk from the rest, who were called the "laity"—received honor and reverence because of their high calling.

Then came the long centuries when new barbarian peoples were moving over the face of Europe, conquering and being conquered, and learning to forsake their old gods and to believe in the "Faith of Christ." In those days war and bloodshed were very common. But although the clergy were not at all secure from violence, yet they were protected much more than the rest of mankind, and were allowed to give protection to people who took refuge among them. Those who fled for refuge to a church or convent were said to have "taken sanctuary."

Moreover, in those days all the people in the western half of Europe belonged to only one Church. All the clergy were ruled over by bishops—overseers of great districts called "sees"—except that those who lived together in monasteries were not always subject to the bishops. The pope, the Bishop of Rome, was acknowledged as the head of them all and was called the "Vicar of Christ," meaning the Viceroy of the Kingdom of God on earth.

Now, some of the clergy became missionaries and traveled among the heathen nations and taught them to become Christians, though most of

them prayed and preached and taught among their own people. And, seeing that the lay-folk, or laity, had to spend so much of their time in fighting, it was only the clergy who were left in peace to think about learning and writing books. And because they were the only people who had much of the knowledge that could be gathered from books, kings often chose from among the clergy the counselors they most trusted to make laws.

Preachers rebuked kings and became rulers of nations

Sometimes wise and brave men among them would boldly tell the kings and the nobles that they were playing the part of tyrants and thus disobeying the laws of God, as the prophets of whom we read in the Old Testament used to reprove the kings of Israel and Judah. Some of them held that, although the pope was not a king, he was greater than all kings, who were bound to obey him. They claimed that the clergy should obey the pope rather than the king in whose dominions they lived. Many times there were quarrels between the kings on one side, and the pope and the clergy on the other. These are often described as quarrels between the State and the Church. And thus it happened that some of the clergy had to become statesmen. They had to take part in the governing of nations, even though they would very much have preferred to have nothing to do with such troublesome matters.

We shall not talk now about the early Fathers of the Church, which is the name given to the men who built up the great Christian society in the first centuries, nor about the martyrs who died because they would not sacrifice to false gods. But we may begin our list with the man who spread the faith in the northern part of Great Britain before Augustine landed in Kent and began to convert the Saxons in the south.

Columba and his followers brought Christianity to Scotland

This was the missionary who is called St. Columba. Born in Ireland in A.D. 521, he lived there for a long time and founded several monasteries. For the Irish were Christians while the great majority of the people in England and Scotland were pagans, though it is true that many of the Britons had remained Christians after the Angles and Saxons conquered so much of the country.

One of the men who had carried Christianity to Ireland, nearly a hundred years before Columba was born, was the interesting figure known to us as St. Patrick. He was born probably in Scotland, of a noble family, in 396, and was captured and taken to Ireland as a slave in 411. Escaping, he became a priest, and returned to work in Ireland. He died about 469.

When Columba was forty years old he resolved that he would go to the people of Scotland, who were related to the Irish, and preach the Gospel among them. So he went with twelve of his followers and built a monastery on the Island of Iona, of which we can see remains to this day. From that little island he and his followers went out and preached the Gospel among the rude heathen tribes, and converted many.

Next we come to Pope Gregory I, who is rightly called "the Great." He was a Roman noble and might easily have become one of the greatest officers of the Roman Empire. He chose rather the life of prayer and of service to God, having no thought of his own honor. Yet out of his self-denial the highest honor came to him unsought.

Gregory's wisdom and his goodness won him such love in Rome that when Pope Pelagius died, all men said that no other man should be pope but Gregory. Though he strove hard to be excused, no other man would they have. But, being made pope, he wrought nobly for the Church, and won barbarous peoples over to the true faith.

Pope Gregory, who sent Augustine to England

Moreover, it was this Gregory who sent Augustine to England on a mission to convert the Saxons, as we may read in Church annals. He was fain to undertake this mission himself before he became pope, but even then the rulers of the Church could not suffer him to depart into a far country, having need of him at Rome. And besides all that he did to spread the faith of Christ, he did much to maintain discipline and agreement among the clergy. And men say he gave the Church the chants which are called Gregorian after him.

Now we come to the first Englishman on our list—the Northumbrian Bæda, who is commonly called the Venerable Bede. All England had already become

Christian some years before he was born. In his time the kingdom of Northumbria was the most peaceful part of the land, and its kings cared much both for religion and for learning. Bede is famous neither as a missionary nor as a statesman, but because, living quietly all his life in the monastery of Jarrow, he was known as a very learned man of his time. There was hardly anything that he could not teach better than any other man living in England. But of the books that he wrote, two are very famous. One is his history of England, which tells us nearly all that we know of the early Saxon times. The other is his translation, in the year A.D. 735, of St. John's Gospel into the Anglo-Saxon tongue, which is famous because of the story told on page 126.

DUNSTAN, THE ENGLISH BISHOP WHO PROTECTED THE SLAVES

A very different man comes next—Dunstan, another Englishman, who was born in 925. He was a very clever man, learned and skilled in all manner of arts and sciences, so that at one time men declared he must be a sorcerer. But what was more important was that he was a great statesman who was the real ruler of England for a great many years. During those years, being Archbishop of Canterbury, he also made many changes in the government of the Church and made the power of the clergy greater than before.

It was through the wisdom and the counsel of Dunstan that England prospered so greatly in the time of King Edgar, of whom it was said that eight vassal kings were the oarsmen who rowed his barge on the river Dee. For Dunstan said that the people who lived in that part of the land which was called the Danelaw, being for the most part not Saxons, but Danes, should be suffered to keep their own customs. His counsel was followed, and they ceased striving to set at defiance the overlordship of the Saxon kings of the house of Alfred. Also he set himself to keep the clergy a folk apart from the laity by making them keep stricter rules and by forbidding them to marry.

One very good thing he did was to give protection to slaves and to teach their owners that it was a good thing to set them free. For in those days there were many slaves in England, and the law suffered their masters to kill them, and laid but light penalties on anyone who slew a slave. But Dunstan taught that in God's sight slaves are quite as good as other men. The priests were forbidden to pronounce the words of pardon for wrong done to a slave unless the wrongdoer repented of his sin and did penance for it as much as if he had wronged a free man.

WILLIAM THE CONQUEROR SET LANFRANC OVER THE CHURCH

When William the Conqueror made himself king of England nearly a hundred years later, he was ill-pleased with the state of the Church in England, where the clergy had gone back from the strict ruling of Dunstan. To fill the office of the Archbishop of Canterbury, he brought to England an Italian, Lanfranc, who had been the head of the Abbey of Bec in Normandy. For William wished to have the help of the Church in keeping the Norman barons from becoming too powerful and troublesome, and he knew that Lanfranc would aid him therein.

To this end Lanfranc persuaded William to increase the power and wealth of the Church, and also to separate the clergy from the laity even more than Dunstan had tried to do. Therefore, in the bishoprics and at the head of the great monasteries, called abbeys or priories, he set, whenever it was possible, not Englishmen, but foreigners, who lived by the stricter rule. He put an end altogether to the practice of the clergy's marrying. He arranged with the king that from this time the clergy should be subject, in their private doings, not to the ordinary laws of the land, but only to the law of the Church, and should be judged by courts made up only of clergy. Moreover, if there were disputes between clergy and laity, these Church courts should judge.

WILLIAM RUFUS' WICKEDNESS WAS STAYED BY THE SCHOLAR ANSELM

Now, after William the Conqueror died, William Rufus, "the Red King," came to the throne, and soon after that Lanfranc died also. The king would not appoint a new archbishop, but seized for himself the money which the archbishop should have had for the use of the Church. Yet, when William fell very sick and thought he was about to die, he feared for his soul because he had robbed the Church, and so he appointed a new archbishop. He fancied he could save

his soul if he died, and continue in his evil courses if he lived, if he chose for archbishop someone whom he could frighten into working his own will. So he appointed a certain very gentle and pious scholar named Anselm, another Italian, who was now Abbot of Bec, as Lanfranc had been. Anselm was fain to refuse, but, as he might not, he very soon showed William how ill he had judged him by reason of his gentleness. The gentle Anselm was a very lion for boldness in the cause of justice and righteousness. He would in no wise obey the king's behests when they were evil, as they commonly were. Nor would he suffer William to rob the Church or to set up at his own will bishops and abbots who would do his bidding and pay him great sums of money.

The sea-rovers often raided the English coasts and carried off men, women and children to sell in other lands. Pope Gregory once saw some fair-haired slaves in the market at Rome. "Who are they?" he asked. "Angles," was the reply. "Not Angles, but angels," said Gregory. It was probably then that Gregory resolved that the Gospel should be sent to the home of those fair-haired strangers.

The strife between them waxed so hot that Anselm had to leave England. When William Rufus was dead, and the wise king Henry I reigned in his stead, Anselm came back to England. He readily made agreement with the king that the bishops and abbots should do the king homage for their lands as the barons did, but should be appointed according to the rules of the Church, and not according to the will and pleasure of a king whose intent might be evil.

Three hundred years have passed, and we witness in this picture a very different scene. Christianity has been working its way through the length and breadth of the island, and here we see a bishop setting free the slaves of a master who had become a Christian, and consequently felt it wrong that he should have the power of life and death over a servant.

This quarrel between the kings and the archbishop was a part of the great quarrel between Church and State which had been going on for many years. For there had been at

Rome a certain monk named Hildebrand, who had been the chief adviser of more than one of the popes, and then himself became Pope Gregory VII. Now, Gregory held that it was the will of God to rule the world through two powers—the temporal power, meaning the emperors and kings of the different countries, and the spiritual power, meaning the Church (which was one in all lands) ruled over by the pope. And of these two powers he accounted the spiritual power the greater, very much as Samuel and Elijah spoke the Word of the Lord to Saul and Ahab. And so it seemed to him that the reign of God upon earth would be made manifest only when emperors and kings humbled themselves before the pope. And this he believed all the more because he knew that he himself loved righteousness and hated iniquity, whereas the emperors and kings sought their own advantage more than the glory of God. Therefore Gregory would have the Church set wholly free from the rule of emperors and kings. But these latter were in no wise ready to believe that the bidding of popes and bishops was in very truth the voice of God. The kings would have all men in their realms obey them, priests as well as laymen. So there was strife between Pope Gregory and Emperor Henry IV of Germany.

Here we see Egfrid, king of Northumberland, offering the bishopric of Hexham to Cuthbert, who began life as a shepherd, but became a monk at Melrose, and subsequently led the life of a hermit on an islet off Northumberland. It is not known whether he accepted the king's offer. In 685 he became Bishop of Lindisfarne, but resigned soon afterward to return to his hermitage. He died in 687 and was buried at Lindisfarne, but his body was later removed to Durham Cathedral. This picture was painted by W. Bell Scott, the British artist and poet.

POPE GREGORY KEPT AN EMPEROR STANDING THREE DAYS IN THE SNOW

Those who wished ill to the emperor were ready enough to aid Gregory against

him, and so the emperor was forced to humble himself for a time. He had to stand in the snow in the garb of a penitent for three days at a place called Canossa, praying for the pope's pardon, though in after-time he defied Gregory again and got the better of him. Yet Gregory had taught so many men to believe that in this quarrel the cause of the Church was the cause of God, that for nearly two hundred years to come it often seemed that the pope was mightier than emperor or king.

So it befell that there was another pope to whom one of the greatest of the German emperors, Frederick Barbarossa, was forced to submit himself for a time; and this was the only Englishman that has ever been pope. His name was Nicholas Breakspear, but when he became pope he was called Adrian IV, just as Hildebrand had been called Gregory VII. But Adrian was not a great enough man to be mentioned here, except for his having been the only Englishman that ever was pope. He died in the year 1159.

But in Adrian's days there was a famous archbishop who stood up against the king of England, Henry II. For the king saw that much evil came of the rules that had been useful when they were first made by Lanfranc and William, because the Church courts were now used to protect the clergy from being properly punished when they broke the ordinary laws of the kingdom. And he thought that if his friend Thomas à Becket were made archbishop, he would help him to make the clergy submit to the law. But when Becket became archbishop, he became the champion of the Church against the king. He would not consent to any change, declaring that the clergy must be punished only by the power of the Church and not by the power of the king. The brave Becket was slain in the cathedral at Canterbury. How the king did penance for that murder, and did not dare any longer to strive against the power of the Church, we read in Church history; also how Adrian IV bestowed Ireland upon the king of England.

Dunstan was a clever and pious Englishman. As Archbishop of Canterbury his influence over the kings was so great that he was himself the real ruler of England. He gave protection to the many slaves at that time in England, and encouraged their owners to grant them freedom. In this picture we see him reproving King Edwy for having broken one of the laws of the Church.

And now we come to the pope who is reckoned by some the greatest of all. He was not only the most powerful, but also, like Gregory VII, one who loved righteousness and hated iniquity. Nevertheless, in after-times men have not all agreed that he was right in some of the things which he counted for righteousness or for iniquity. This pope was Innocent III, the youngest man that was ever made pope. Like Gregory, he believed that the pope was set over the Church and over all men as a ruler, having all sceptres and thrones subject to him.

POPE INNOCENT MADE STEPHEN LANGTON ARCHBISHOP OF CANTERBURY

So great was Innocent's power that he was able to decide which of two princes that claimed to be emperor should be acknowledged. When the great king of France, Philip Augustus, committed sin, he made him cease from his wrongdoing. The king of Leon, in Spain, was treated

AN EMPEROR THREE DAYS IN THE SNOW

In the struggle between Pope Gregory VII and Emperor Henry IV of Germany the pope declared that the emperor could no longer be a member of the Church, and deposed him from his throne. Henry, unable to bear the results of this disgrace, journeyed over the icy slopes of Mont Cenis, in the depth of winter, that he might make his peace with the pope. Gregory retired to Canossa, high up in the Apennines, where he was followed by the emperor. For three days Henry, clad in the thin white robe of a penitent, shivered in the courtyard of Canossa until the pope forgave him.

in like manner. We read in the history of England how he placed that land under an interdict, and would have taken away King John's crown and given it to the king of France if John had not made submission. Therein Innocent thought he was doing what was right, though in England there were few who were ready to admit that any foreign priest, were he the pope himself, had power and authority to choose a king for England. Yet the pope did these things out of the desire that men should live righteously.

Now, there was one thing he did for which British and Americans alike should respect his memory. The archbishop that he chose for Canterbury was Stephen Langton; and Archbishop Stephen feared neither Pope Innocent nor King John. He stood up manfully for justice and right, claiming from the king for the Church no more than the Church's due, and yielding to the pope's bidding no more than was his due. What Langton had at heart was the good of the whole people of England.

Stephen Langton was one of the greatest churchmen that ever had power in England. He feared neither the pope nor King John. Here he is persuading the barons to help him obtain Magna Carta from King John.

Pictures pp. 2846, 2848, 2850, permission of the Society for Promoting Christian Knowledge.

When Innocent was reconciled to John by the king's submission, Langton was none the readier to suffer John to play the tyrant, but himself played a large part in uniting the barons to demand from the king the Magna Carta, or Great Charter. This he did, though Innocent himself bade him desist. And thereafter, when John was dead, and there were some barons who disliked the Charter because it hindered them also from playing the tyrant over their vassals, it was through Langton's influence that the Charter was again confirmed in spite of them. This Charter is the foundation on which our liberty has been built. When Langton himself was dead, there were other bishops ready to follow the great example he had set, yielding to the dictation of neither pope nor king nor barons, but standing up stoutly against tyranny and oppression. Of these other bishops there are two whose names should be remembered—Archbishop Edmund Rich of Canterbury, and Grosseteste, Bishop of Lincoln, who was the friend of the great Earl Simon de Montfort. Grosseteste, who was born of humble parents, was a brilliant youth. His great promise won for him an Oxford education which made him proficient in law, medicine and the natural sciences. At Oxford he met the Bishop of Hereford, who turned his thoughts toward the Church. He became rector of the Franciscan school at Oxford and eleven years later became Bishop of Lincoln. Grosseteste was noted for the zeal with which he upheld the rights of the Church against the claims of the State. But in questions between Rome and the Church in England he stood by his countrymen.

Other bishops and popes there were in later days who strove hard in order to make the power of the Church greater than the power of the rulers until the Reformation. After that event the rulers were never again forced to bow to the will of the pope, and the heads of the Church were never again the great power in the land that they had been.

THE NEXT STORY OF MEN AND WOMEN IS ON PAGE 2977.

Helping Mother, by Joseph Israels.

EUROPEAN ARTISTS OF LATE YEARS

CONTINUED FROM 2714

WHEN we consider the art of Europe as a whole, our thoughts are divided. In one way it seems that the revelation of true pictorial art was made in Italy, once and for all, several hundred years ago, and in another way it would appear that that glorious epoch was just one phase of a civilization still in its infancy.

The thoughts of beauty-lovers always turn to Italy because, although other countries shared the vitality of those wonder years, she was the centre, the throbbing heart, of the Renaissance. More great work was packed into a few generations in Italy than has been spread over as many centuries elsewhere.

One of the most fascinating things about European art is that we see certain periods standing out as first this and then that country achieved greatness. The idea, the inspiration, came; the country roused herself, did that which was in her to do, then folded her hands and sat still. Thus we have the glory that was Spain's, and then comparative eclipse; the single century of Holland's vision, and then the closed eye. Nearer at hand, and therefore more difficult to set in true proportion, we see the time when art in England rose to a single height which she has not since regained. And nearer still we are confronted by the changing and powerful figure of art in France. The Slav races and the Scandinavian people, broadly speaking, have yet to play their parts. The fundamental art of Russia as revealed by its peasant industries is marked by beautiful and restrained color and form. The workman carves and paints and weaves without any idea of creating great works of art but because to him it is natural to do these things. Therefore he achieves without conscious effort something that an artist of another race would labor in vain to accomplish. The modern Russian and Polish painters are showing what a power pure color really is. We have seen something of this Slav genius in the setting of the modern Russian ballet.

In the meantime there have been painters of the more traditional kind at work. An artist who will be remembered a long time in Russia is Vereshchagin, who lived from 1842 to 1904, and whose historical pictures are to be seen in the chief museums of the country.

Vereshchagin combined the art of telling a story with the decorator's instinct, and he centred his interest in the Napoleonic wars; in fact, he may

be said to be the painter of the defeats of Bonaparte in Russia. Other cycles that he painted depict war in India and the Spanish-American War. Vereshchagin exhibited often in the United States. He lost his life on a Russian battleship sunk at Port Arthur.

Ilya Répin, the Russian, has made his name as a portrait-painter. Among his best pictures are studies of writers like Gorky and Tolstoi, musicians like Glinka and Rimski-Korsakoff.

Tolstoi, by Jan Styka.

Jan Styka, the Pole, born in 1865, is another historical painter who has made pictures of his country's history, but not in an isolated epoch as Vereshchagin did in Russia. Styka had the history of centuries in his mind when he began his scenes of Poland, and so we have pictures like The Oath of Prince Witold (1362), The Death of Ulric at the Battle of Grünwald (1410), General Kosciusko at the Battle of Matchevitz (1794). Styka has also made a name for himself as an illustrator of Quo Vadis, and has done some fine drawings of scenes in the Odyssey. But the main work of painters like Styka and Vereshchagin is in interesting decoration and story-telling.

During the last century several painters of Swiss birth have done some noticeable work—men like Böcklin (1827–1901), Hodler (1853–1918), and Burnand (1850–1921). Burnand was perhaps the most popular, Hodler the most powerful, Böcklin, who lived and worked in Germany, the most brilliant. He was romanticist and realist in one, sometimes painting classic myths "in terms of German realism." His originality at times led him into extravagance in color expression. A fine example of Böcklin's work is The Nereids, in the Basle Museum.

The art of Scandinavia includes work by men of Norway, Sweden and Denmark—a number of "sane and high-minded painters, for whom the portrayal of their own country and people is of first importance." They are portrait-painters, animal-painters and painters of landscape, most of them engaged, like practically all other artists of our time, in working to find out the secrets of light. Theirs is a land which gives them special problems of light reflected from gleaming white surfaces and of the contrasts of dull, dark water set amid snow and ice. There is a strong decorative quality in much of their work. Among Scandinavian artists we must especially note Anders Zorn, Carl Larsson, Fritz Thaulow and Edelfelt, a native of Finland.

Germany's share in recent work may be summed up in the decorative, historical paintings of Menzel, the portraits of Lenbach, and the realistic studies of Liebermann. Menzel did his best work in his scenes of the period of Frederick the Great. He was always correct in his detail, so that his canvases form illustrations for the history of the time; but he lacked the picturesqueness that Vereshchagin showed.

Lenbach takes his place among the painters of the last century by means

The Meadow, by Anton Mauve.

of remarkable pictures like the portraits of Bismarck, of which he made several, and those of the Old Emperor.

While German artists have formed a number of groups, all of these fall into two general types, with Berlin for the Northern centre and Munich for the Southern. In Germany, however, as in other countries, the tendency is more and more to select from among the traditions and the methods of all times and all parts of the world of art.

The new art which, as we know, has been worked out by French artists, together with one or two painters of other countries, like Picasso the Spaniard, and Modigliani the Italian, has run like fire in dry stubble throughout Europe. Since the beginning of the last century there is not a country large or small but has produced pictures reflecting the movement in Paris. Some of them are so extremely new as to be a little bewildering; but a great many of them are merely imitative.

The general trend of the modern work is toward a more decorative and architectural art than Europe has yet known, and this in itself is of enormous value. Severity, simplification and decorative treatment are needed to restore the lost values to pictorial art; and in so far as the upholders of modern art supply these qualities their work, however extreme it may seem to us, is for good.

In the meantime some very fine pictures executed on more traditional lines have been produced in Holland and Belgium. In the paintings of the Maris brothers, Israels, Wauters, Mesdag, Leys, Bosboom and Mauve the genius of the Netherlands seems to have reawakened.

Jacob, Matthijs (Matthew) and William Maris covered in their lifetimes most of a century; Matthijs, the last, died in London in 1917. Each was distinguished in a peculiar and personal way.

William Maris painted chiefly animals, and in his latter years his broad technique created very brilliant effects. Matthijs—or Thijs Maris, as he was usually called—was a visionary, a dreamer.

Jacob Maris worked in a wider range of subjects. He painted figures, landscapes, interiors, all with the same breadth and nobility of expression and with brilliancy. He had the secret of capturing the light of the wide, still Dutch landscape. In all his work there is a dignity that recalls the seventeenth-century Dutch school.

Anton Mauve, who lived from 1838 to 1888, painted poetic landscapes showing Nature in her tenderest moods. His are sweet, lovable pictures, such as those on this page.

Josef Israels (1824–1911) is a fine, sombre figure in this group of Netherlanders. His early pictures are of a historical kind, like the Margaret of Parma and William of Orange, in the Amsterdam Gallery. It happened that for health's sake he was banished to a North Sea fishing village, and there he began the kind of work with which his name is associated. His mind turned naturally to the grave events of life—in many ways it might be said he saw beauty in shadow. Israels is true to the tradition of Dutch art in his simple, noble way of presenting and interpreting the common life of the poor, old and young. In the Metropolitan Museum of Art, New York, several canvases represent this phase of Israels' work, and in the Tate Gallery, London, is a painting called The Philosopher which shows his peculiar gifts. The canvas is an area of rich gloom lighted by one candle. Israels also painted some excellent portraits.

Spring, by Anton Mauve.

A contemporary of Israels, Johan Bosboom, had something of the gravity of Israels and his feeling for lighted effects. He had also a strong love for architecture, and it is easy to understand, looking at his pictures, how he had gone from one cathedral in Europe to another, drawing, studying, learning. The greater part of his work is the painting of church interiors; and such was his love for the subjects that he often treated the same interior from several points of view.

Mesdag, who died a few years ago, was a marine painter. His pictures of seas and fishing-smacks, powerful, realistic studies, were unique in their generation, and his work is to be found in most of the galleries of Europe. He was collector as well as artist, and in the course of his life gathered together treasures of art which many men envied. In 1903 Mesdag and his wife presented their collection to the State—a truly royal gift; and thus, in addition to the merit earned by his painting, this artist will have a lasting memorial in the Mesdag Museum at The Hague.

In Spain after the time of Goya there was a long interval before another light of any importance appeared in the world of painting. Even then, Fortuny, who became famous after the middle of the nineteenth century, did not bring to life again the essentially Spanish qualities of Velasquez and Goya, but fitted himself into the art story of France rather than that of Spain. It remained for two men of truly modern feeling to revive the old Spanish tradition. Joaquin Sorolla y Bastida (1863–1923) and Ignacio Zuloaga (1870–) in quite different fashion have brought into the art of to-day something of the atmosphere of the great Spanish painters. Sorolla, the more skillful painter of the two, is not so obviously like the older artists, but in him is restored the more vital thing—the manner, the faculty of grasping the very central and foundation aspect of the subject and presenting it as a whole.

My Cousin Candida, by Zuloaga.

In Zuloaga's painting we have no difficulty in seeing the qualities that belong to Spain alone. He is thoroughly racial in his expression. While he is not a highly accomplished colorist, the broad strong colors in his canvases are unmistakably Spanish; and he impresses us with the sombre, the strange, even the harsh and terrible aspect of things. He works with breadth, vigor and intensity in both portraiture and landscape.

Sorolla, on the other hand, paints sky and air and sea full of light, and sets in this atmosphere radiant figures of boys and girls. Whether they are seen through the green shimmer of the waters where they swim, or move across bright sands, they seem buoyant and vital and sweet. Both artists are painters of portraits.

While these artists do not stand alone, we shall let them represent the painting of Spain to-day, together with Picasso, of whom we have already spoken as a leader among impressionists. He has puzzled even Paris with his strangely constructed compositions.

Italy, too, had a great gap in her art before any modern painter of her race won wide notice. Boldini, the first to show distinctly modern feeling, like Fortuny, belongs to France more than to Italy. Segantini, dwelling among Alpine mountain-tops, has painted them in their lonely strength, with the feeling and skill of a fine plein-air artist. Previati, more mystic, chooses the old themes from the life of Christ and the Virgin, but presents them with a modern treatment of light.

To these we may add as representative moderns the names of Mario de Maria, Ettore Tito, Plinio Nomellini and Camillo Innocenti, each of whom stands for a certain independence of style and expression.

If for the moment we turn aside from the schools of the New Art in France, we find ourselves interested in a number of painters who are carrying on the French tradition—painters of portraits, landscapes, figure studies, domestic scenes.

Few of them have escaped the influence of early impressionism, and it is of great interest to notice how this developing force is blended in their work with the study of art in other lands and centuries. We can see here the Dutch influence, there the Italian, there the Spanish. Sometimes the dainty eighteenth century, like an elegant lady in panniers, steps into the field of modern art; sometimes there is a strain of the romance and passionate color of the East. Generally speaking, however, the leading French artists to-day are realists, painting pictures of the pleasant countryside and portraits of everyday men and women.

A large and distinguished group of landscape-artists are devoting their gifts to the study of certain districts in France, particularly Brittany, Provence and the western coast. At the head of this company are painters like Simon, Dauchez, Ménard, Cottet, Montenard, Foreau. Many of them have turned away from the brilliant kind of landscapes worked out by the impressionists and plein-airists; they paint as much in their studios as in the open air, and care more for the spirit of the countryside than for its changing face. A passing effect is not enough for them: they seek the underlying character which passing effects help both to reveal and to conceal.

Beaching the Boat, by Sorolla y Bastida.

Pictures on this page and page 2854, courtesy The Hispanic Society of America.

We can understand something of their attitude by thinking for a moment of any scene with which we are familiar; it may be a street, a riverside, a hill humped against the sky. We see the place in all conditions, and, if we are observant at all, know the transformation that sunshine, mist and driving rain can make, and the more subtle changes made by a hard east wind, "when the very houses stiffen with cold," or by soft airs from the west. We know how the face of the scene seems to change like a human face; but its true character is as sure as the actual form of human features. That foundation character of a district these

artists are spending their lives striving to understand and paint.

Dauchez, born in 1870, paints the wide horizons of the west of France, the long lines of the Atlantic dunes, the coast ridges broken by rare, wind-swept trees. His pictures, year by year, are making memorable these wonderful scenes of a very beautiful part of France. They are to be found in the public galleries of many countries.

LANDSCAPE-ARTISTS OF FRANCE, AND THE PICTURES THEY ARE MAKING

Foreau is another gifted landscape artist who loves to paint morning on the marshes and the seaboard, the western skies full of clouds and light. Simon and Cottet stand out among the many painters who make Brittany their chief working-ground, painting the life-scenes of the Breton peasants.

Ménard, born in 1852, has been for a generation one of the foremost Salon artists. Sometimes he paints pictures of the Mediterranean, sometimes landscapes of Brittany, Provence, Fontainebleau, the Midi. He has a great love for antique art and classical legend, and thus we see from time to time pictures like Le Jugement de Paris, L'Age d'Or and Le Bain de Diane. But in all Ménard's work, whether it be pictures of this kind or pure landscape, like the Coucher de Soleil, Côte de Provence (painted in 1921), there is something of serenity and calm that dimly calls back to the mind forgotten legends and stirs echoes of the ancient world.

Montenard is another artist who belongs both to yesterday and to-day. He was born in 1849 and had the good fortune to work in the studio of Puvis de Chavannes. His pictures reflect a love of his native Provence, its beautiful light and picturesque life. During his later years he has painted many religious pictures. Two of his landscapes are in the Luxembourg.

THE PORTRAIT-PAINTERS WHO MAKE THEIR PICTURES SEEM TO LIVE

Portraiture and figure-painting have a large place in French art to-day. Men like Roybet, Ricard, Bonnat, Carolus Duran and Henner long carried on the traditions laid down by the best French portrait-painters. It would seem that although no two men see alike or paint in the same way, and each is held by his own ideals, yet through all runs a strain of sober, serious work in which no easy tricks are allowed to usurp the place of honest labor.

In the present day portraits, of men particularly, depend more on the personality of the sitter and the strength of the painter than in former generations, when by a richly colored and generous costume a picture was already half made before a line was given to face or hands. In portraits of men painted to-day the face is the picture; the costume of modern times is usually a hindrance rather than a help to the artist.

We have to remember this when we compare the work of centuries in portraiture. It is not easy to look at the face alone and ignore the gallant dress of old-time soldiers and courtiers; and by comparison a modern portrait often appears less worthy because the costume is dull and monotonous. The best test of the portrait-painter is whether, in these uninteresting conditions, his pictures seem as powerful as those of a bygone period. The leading French portrait-painters easily pass this test.

THE MEN WHO TURNED TO THEIR ANCESTORS FOR INSPIRATION

It is interesting to see how, in a country and a generation which tend to look ahead and repudiate the past, these portrait-artists have turned back centuries for guidance and inspiration. The developments of the last sixty years have made landscape-painting a continually new art. Portraiture depends not at all on season and very little on accidental color, but rests on the innate strength of the artist to draw out and put on his canvas the soul as well as the body of the sitter.

Thus the art of portraiture has changed little. Velasquez and Rembrandt knew more about it than anyone since has learned, and it is a sign of their very clear vision that Bonnat and Carolus Duran have studied the seventeenth-century Spaniards and tried to learn their secret, and that Ricard and Roybet have taken the Dutch for their masters.

Léon Bonnat (1833–1922) is one of the finest portrait-painters France has produced. He began his studies in Madrid, under Frédéric de Madrazo; and this artist, carrying on the great Spanish traditions, had a considerable effect on the career of his pupil. But it would seem that Bonnat the man helped to make Bonnat the artist the fine influence which still

A PASTORAL SCENE, BY MONTENARD

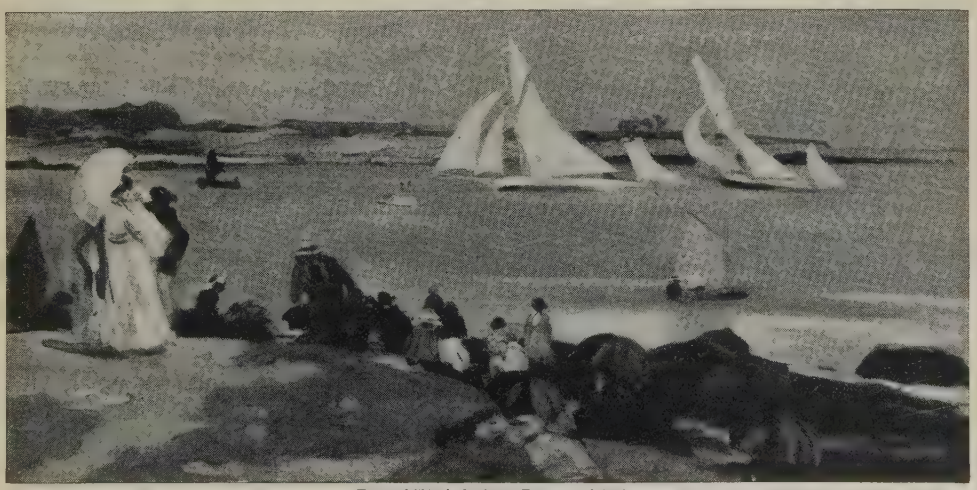
lives in France. He was a man of great honesty and truth, and these qualities appear in his portraiture.

Bonnat saw deep into the mind and character of his sitter, and, having seen, must needs tell the truth on the canvas. His painting is as vigorous and clean as his purpose. He gets the strength into his portraits by "hammering out," as the artists say, the lights and darks, by insisting on every line, every curve, that makes character in a person's face.

Bonnat carries his forceful modeling sometimes, it would seem, beyond Nature's. But he makes a picture full of life and strength and marked by that simplicity of purpose which was this painter's merit, and is one of the great secrets of fine portraiture. The eye of the beholder is never allowed to linger on unimportant details like chairs or backgrounds.

Bonnat has left some good historical pictures, but his fame will live in his portraits—such as those of Renan, Thiers, Victor Hugo, Léon Cogniet, Puvis de Chavannes, Pasteur, Alexandre Dumas, Fallières, Faure and many others.

A little less forceful than Bonnat is Carolus Duran, but both artists show the immense debt they owe to the genius of Spain. From Velasquez and Ribera they learned the secret of color power, the art of treating a picture in such a way, by placing certain colors against each other,



REGATTA DAY, BY SIMON

that not a grain of strength is lost. We can see this in Duran's well-known picture The Lady with the Glove, in the Luxembourg.

A PAINTER OF HISTORY WHO SOUGHT THE SECRET OF REMBRANDT

Roybet (1840–1920) is an interesting figure in modern French art. His pictures have the secret of warm color and rich dark tones that we associate with Rembrandt and Hals, and the figures in his studies are intensely alive. He has executed many portraits, but is above all the painter of historical scenes from life in the sixteenth and seventeenth centuries.

Jean Paul Laurens (1838–1921) was another painter of historical scenes, a sincere and gifted man who added to the artist's vision a profound knowledge of his subjects. A strong decorative sense, a skill in composing, mark all his work. Some of his finest paintings decorate the Hôtel de Ville de Paris, the Panthéon, and the Odéon Théâtre. The Death of the Duc d'Enghien, and The Excommunication of Robert the Pious, in the Luxembourg, are among his many famous pictures.

An artist of another kind is Henner, above all a figure-painter, and not so much interested in portraiture and large decorative work, like Laurens, as in nude studies. He paints delicately and surely, and his flesh tints are marked by a beautiful silvery light. There are two well-known pictures in the Luxembourg, An Idyll, and St. Sebastien, which show his peculiar gifts.

THE LOVE OF ART IN FRANCE THAT WILL NOT PASS AWAY

Valloton, Bricard, Chabas and others year by year exhibited excellent portraits in the French Salon. Bricard works in many ways, painting pictures of women, studies of children, nude studies, flowers and still-life. Chabas excels in portraits of women and young girls. Valloton is a strong, individual painter who turns from portrait to landscape, from landscape to still-life, and in each picture shows that he is still learning, still struggling to attain.

We know that French art to-day is a powerful presence in the world's work, and we can but scan a little of it in passing. The French are notably an artistic nation. They care about pictures in a very special way. All the changes that take place in the art world are eagerly noted by them and reflected in their life. It is this natural appreciation of art which has helped France to gain the leadership in modern painting.

It is now almost two hundred years since the great period of English art—the time of portrait-painters like Reynolds and Gainsborough, of landscape-artists like Crome and Constable. There has never since risen a school of English painting so individual and marked by such simple strength and dignity.

Nineteenth-century art was a story of many little schools and fashions, of easy successes and small rivalries. The outstanding men of the century, Turner and the Pre-Raphaelites excepted, were a few portrait-painters in whose work lingered, however faintly, traces of the eighteenth-century traditions.

In the story of the world's art the beginning of the twentieth century will long be remembered—a time of violent changes and reactions against the principles of art established centuries ago. Scientific experiment is continually upsetting our newest theories. On the art, music and literature of our younger men the restless age is stamping itself.

NEW MOVEMENTS AND OLD ART TRADITIONS IN BRITISH PAINTING

The mass of English artists work either on traditional lines, like members of the Academy, and similar groups such as the Royal Institutes; or on an advancement from these traditional lines, like the painters of the New English Art Club, founded about thirty-five years ago, an offshoot of the impressionist movement in France, and those of the Newlyn School.

British art to-day owes a great deal to the founding of the New English, as it is commonly called. The new society had the effect of a fresh breeze on a sultry day. Most of the founders had studied in France, and they brought vigor and life into the languid English art of their day. They gave a different standard by which to judge, a broader point of view; they are largely responsible for the dying-out of the little nineteenth-century "schools" of painting, which can have no permanent place in the story of European art. The best painters of twentieth-century England, to whatever community they belong, still keep up the English spirit; they excel in portrait and landscape.

THE INFLUENCE OF PHOTOGRAPHY ON THE PAINTING OF PORTRAITS

And here, speaking of portraiture, we must not forget one important point. Photography has taken the place of the old portrait and portrait miniature. It is no longer enough for a painter's picture of a man or a woman to be a speaking likeness. The photographer will supply that for a reasonable price. More and more is it necessary for a painted portrait to show something elusive—something of the mysterious call of pure color, of the appeal of imagination. It is these qualities which make the work of men like Lavery, Orpen, Strang, Steer and McEvoy so arresting.

Lavery is an Irishman, and it has been said that his best pictures have become emigrants. Certainly they have found homes in many lands and cities—in the public galleries of Paris, Munich, Leipzig, Berlin, Brussels, Rome, Venice; in Sydney, Ottawa, Philadelphia, Pittsburgh, Buenos Aires, Santiago de Chile. Lavery's work is distinguished. His stroke reminds one of Velasquez; his palette is simple and strong. Among other pictures in the National Portrait Gallery are his portraits of England's king and queen. According to French critics, Lavery's three best pictures are Spring, in the Luxembourg; The Blonde, and the portrait of the lovely Quaker girl called Mary in Green, in the Ottawa gallery.

There is always a decorative feeling in Lavery's portraits—sometimes too much decoration, his critics say. In the portraits by Orpen there is quite another kind of treatment. Orpen likes to paint his people at home. There is generally a hint of human interest in the background and in the settings themselves. It is over twenty years since his remarkable picture, A Mere Fracture, attracted attention, and it showed a curious likeness to the paintings of home life by the Dutch masters.

Orpen's work has developed and changed as the years have passed. He paints portraits of varying kinds. As is true of all the artists of the New English group, his painting is broad and strong, the brush work vigorous, and one or two dominant notes of color give the key to each canvas.

William Strang, a Scotsman whose death in 1921 made a gap in the community of modern artists, was a portrait-painter of unusually clear and definite strength. Strang passed through a great many changes in his artistic development. Toward the end of his work there was nearly always a hint of processional movement in his pictures, as if the people were standing still for one moment and then would move on.

THE PICTURES WE REMEMBER FOR THEIR GREAT SIMPLICITY

Strang was a great draftsman as well as a "colorist of notable fancy." His construction was always faultless. Often the people he painted seem a little unreal and remote—they are like carved figures in a relief, and because of their intense simplicity they linger in the memory. Strang will be best remembered for his portrait groups.

A very individual figure in the art of the last twenty years is Augustus John. He is another painter whose draftsmanship is perfect. There are few finer line drawings to be seen in London than his.

John is a past-master of portraiture. He is at home with any kind of sitter, from little Robin, whose picture was one of those bought by the nation, to city dignitaries and ladies of society. On the other hand, like many of the most modern painters, in his subject pictures John sometimes plays tricks with his drawing, and the ordinary observer is left groping, and saying what one so often hears in exhibitions to-day, "What does he mean?" Sometimes John paints landscapes alone, and these are treated, as one would expect, with a rigid simplicity and fine strength of color.

THE MAN WHO CAUGHT THE SPIRIT OF A LANDSCAPE AND PUT IT INTO PICTURES

The subject of landscape brings us to Wilson Steer, who seems to have been born with the knowledge of how to get light into his skies. His style is impressionistic—he was one of the founders of the New English—and in his work is always felt the elusiveness of English skies and open country.

William Nicholson is another artist who occasionally gives us landscapes, but whether he will be most remembered for his portraits and figure-groups or his still-life painting it is difficult yet to say. Nicholson's still-life pictures are marked by economy of color and a most careful study of tone values. All this artist's work shows a curious reserve and stillness.

THE BEWILDERING VARIETY OF STYLES IN LANDSCAPE-PAINTING

A painter of an entirely different kind is Davis Richter. A rich color sense dominates his pictures, still-life and landscape alike. Philip Connard and David Muirhead have shown from time to time some excellent paintings of open country under wide skies. For landscapes with cattle we look to painters like Arnesby Brown and Bertram Priestman, and we associate with their work the most beautiful aspects of England in the dewy morning or the "gold-dusty" evening. A. J. Munnings has made a name in painting hunting scenes, gipsy pictures and glimpses of rural life in remote parts of the country. There have been many canvases in the Royal Academy which show how well this man who loves horses can paint them. Among these pictures is a portrait of H. R. H. the Prince of Wales mounted on Forest Witch.

Charles Simpson, a younger man, has painted some fine pictures of this sort, and also some beautiful and broad studies of seagulls and wild fowl. But the most powerful animal draftsman and painter of the early century is John Swann, who is also a sculptor. His career stretches well back into the nineteenth century, but none of the moderns seem to have equaled him.

Names crowd to one's mind in making a small survey of the artists whose work belongs to to-day, and about each a great deal could be written. We think of Clausen, Shannon, Solomon J. Solomon—great figures in the generation which is passing; and of Sickert, Sims, Spencer Watson, George Lambert, each individual and yet all held within the circle of English art. Wolmark, Gertler, Louis Sargent, Mrs. Laura Knight stand out among painters whose outlook is increasingly modern.

FRANK BRANGWYN'S FINE PAINTINGS OF THE OLD TRADE GUILDS

Decorative painting has never been a great feature of English art, but this generation possesses a very fine decorator in Frank Brangwyn. Many of his pictures look a little out of place in frames. They should be painted in fresco on a wall. Like most decorative painters, Brangwyn goes either to the East or to past history for his subjects.

Looking at his wall-paintings we can see that he has the decorator's instinct of working inward from the corners of the canvas rather than beginning in the middle with a figure group and working outward to fill up the space. Brangwyn's color is of a vivid, sometimes riotous quality, and to come upon his pictures among a collection of essentially English portraits and studies gives us the impression of being in a foreign land.

A very fine work of Brangwyn's is the decoration in fresco of the banqueting room in the Skinners' Hall, one of the old guild-halls of London City. Here the artist has painted scenes from the ancient story of the English trade guilds. Looking at them, one can realize what a stirring, romantic history London has had.

A decorative artist of another kind is Gerald Moira, who was for about twenty years professor of mural painting in the South Kensington College of Art. His work is stamped by a fresh and daring color sense, and he has great skill in adapting the human figure to the needs and shape of the space to be filled.

Lovat Fraser, who was only a young man when he died in 1921, also belonged to the decorative group of English artists. His gift has been expressed in many ways—in book illustration and stage designing particularly. Fraser's color is beautiful and fantastic and vivid.

MUIRHEAD BONE'S ETCHINGS AND THE LESSONS THEY TEACH US

Many artists nowadays show etchings as well as paintings in their exhibitions. They are called painter-etchers—that is to say, they draw their compositions directly upon the copper. Among the living men, Brangwyn is particularly noted for his fine work in this branch of art.

The British etcher of this generation, who will be best remembered, however, is Muirhead Bone. This artist's genius centres itself in the representations of buildings in the course of erection. Some of his drawings and etchings of superb workmanship are in the British Museum, and there we can see buildings rising out of fairy forests of scaffolding.

Muirhead Bone's etchings bring home a lesson which in our fervor for color we are apt to forget; it is one of the lessons of art of all time—that before we can have great success in painting we must know how to draw.

THE NEXT STORY OF THE FINE ARTS IS ON PAGE 3069.

PORTRAIT OF MADAME SUGGIA, BY AUGUSTUS JOHN, A.R.A.

GEORGE BERNARD SHAW,
BY AUGUSTUS JOHN, A.R.A.

ISABEL PINKNEY,
BY SPENCER WATSON, A.R.A.

MRS. GIBBS,
BY SIR WILLIAM ORPEN, R.A.

MOTHER AND CHILD, BY XAVIER BRICARD

ON THE RIVER IN SUMMER, BY PAUL CHABAS

THE PROCESSION, BY LUCIEN SIMON

MARES AND THEIR FOALS, BY A. J. MUNNINGS, A.R.A.

LEON COGNIET, BY BONNAT

BISMARCK, BY F. VON LENBACH

CHILDREN OF THE SEA, BY JOSEF ISRAELS

A FISHERMAN OF ST. IVES. BY A. ZORN

THE NEEDLEWOMAN, BY JOSEF ISRAELS

OUTSKIRTS OF A TOWN, BY MATTHEW MARIS

BEACHING DUTCH BOATS, BY H. W. MESDAG

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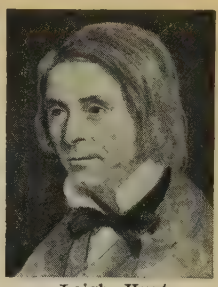
William Hazlitt.

Charles Lamb.

Thomas De Quincey.


Leigh Hunt.

THE WRITERS OF ESSAYS

CONTINUED FROM 2738

THE essay is the easiest form of literature to write, though people who try to write verse without knowing what poetry is apparently do not think so. But, easy as the essay seems, it is almost as difficult to write it so that it is literature as it is to write good poetry.

A very large number of writers who have won distinction in other forms of writing have also written essays. The essay has taken in their hands several forms, particularly as a little sketch of history from the personal view of the writer, or as a criticism of books and their writers. But the true essay is rather a brightly written sketch of some aspects of human life as it appears to the writer. It shows how his wisdom and humor help him to see the world.

The inventor of this delightful form of literature was Michel de Montaigne, a Frenchman of learning and leisure, who began in 1571 the composition of the essays he published in 1580. The essay as it was written by Montaigne justified Doctor Johnson when he said that an essay was "a loose sally of the mind—not a regular and orderly composition." It served the great Frenchman for anything he wanted to say, and its freedom and frank gaiety of spirit quickly carried it all over Europe as a much needed form of writing.

In England it gave Bacon an opening for popular writing, in contrast with his heavier learned style, though he used in his English essays much classical quotation that now is usually left out. Bacon's Essays are more like notes for a fuller consideration of any subject that is in his thoughts than a completed study. Abraham Cowley, the poet-courtier, acted as private secretary to the queen of Charles I when she retired to Europe. He lived in honorable seclusion after Charles II's restoration and is a link in essay-writing between Bacon and the early journalists. These made the essay the first model of the intelligent periodical press.

John Dryden wrote what some have called essays on literary style, but what really was formal literary criticism. It is among the best of its kind. The early journalists, Defoe, Swift to a small extent, Steele, Addison, Johnson and Goldsmith, made the essay popular. It allowed these masters of grace and power to use any subject for lightly handled remark. Mankind, its habits and traditions, its follies and virtues, were the chief topics, and humor was called in to lighten wisdom. At the same period David Hume, the Scottish philosopher and historian, wrote two volumes of formal essays of a grave and reasoning character that greatly widened his reputation. They are good examples of the serious use of the essay.

Among the essayists of the eighteenth century Steele, Addison and Goldsmith were the master-hands,

though Defoe could excel them in biting humor, as is shown in his essay describing a quack doctor. They, however, had in a far higher degree the mixture of humor with tender feeling which never loses its power over the hearts of men. Johnson wrote with a heavier hand, and needed the spur of argument, face to face with another talker, to bring out his literary gifts.

After the Johnson circle was dispersed by death a whole generation passed away without any cultivation of the essay as a form of literature. Then it revived again and reached its period of greatest renown when Charles Lamb and William Hazlitt were its supreme craftsmen, and Leigh Hunt and Thomas De Quincey were doing good work. At the same time the dazzling Macaulay began to write. Charles Lamb's Dissertation on Roast Pig was published in The London Magazine within a year or two of Macaulay's essay on Milton in The Edinburgh Review.

THE HISTORICAL AND LITERARY CRITICISMS OF MACAULAY

Whenever the word essay is mentioned the name of Macaulay comes into the minds of reading people; yet Macaulay's articles are not real essays, though it is through them that many similar compositions have been classed as essays. Macaulay's Essays were really historical sketches and literary criticisms. They often covered a wide field, dealt with human life from the observer's point of view, and seemed to have a good deal of the freedom of the true essay. But they were always planned to reach definite goals in history or criticism, and were never the easy talk of the strolling thinker. They were studies. Probably they, and many like them, will always be called essays; but the essay as it comes to us directly from Montaigne is something different. That difference can best be shown by instances.

Among essays like Macaulay's we find such studies as Thomas Carlyle's shorter literary criticisms of his earlier years, Matthew Arnold's so-called essays, Walter Bagehot's discussions of literary style, John Morley's thoughtful estimates of men and movements in times that greatly interested him, Leslie Stephens' Hours in a Library, William Rathbone Greg's studies of modern problems, and Lowell's critical part of My Study Windows. All these and many similar books are classed as essays because each study is fairly short. Some papers in them are of the essay type, as, for example, Lowell on A Certain Condescension in Foreigners; but the true essay needs to be more informal in spirit than a fixed and limited study with a clearly defined end.

A BRANCH OF LITERATURE IN WHICH THE AMERICANS ARE AT THEIR BEST

As mention has been made of James Russell Lowell, we must remember that America has been richer in the true essay than in any other form of literature except, perhaps, poetry. Emerson is almost wholly an essayist. Lowell is partly one. Oliver Wendell Holmes is one in spirit in his best prose books. So is Thoreau. And to-day we have an excellent illustration of the essay type in Henry van Dyke's books, such as Little Rivers and Fisherman's Luck.

The genuine essayists of later years are such writers as Richard Jefferies, in books like Wild Life in a Southern County, that are more than disconnected jottings about natural history; W. H. Hudson's delightful saunterings and accompanying thoughts; one of Mr. Israel Zangwill's volumes, Without Prejudice; in slighter vein, Mr. Augustine Birrell's lightly etched opinions; and, above all, Robert Louis Stevenson's genuine essays in the true line of descent from Montaigne.

With the central group of English essayists—Lamb, Hazlitt, Leigh Hunt and De Quincey—only two of the more modern men can be fitly placed. The two are Stevenson and Emerson. The first line of all is filled by Lamb, Hazlitt and Stevenson; and the first place of all, without any doubt, is held by Lamb.

LEIGH HUNT AND HIS PLACE IN ENGLISH LITERATURE

Leigh Hunt was the reviver of the informal essay on all kinds of subjects in our daily life that interest us greatly when they are written about with brightness and charm of style, and so he has a right to a place of some distinction. But he never reaches the heights sometimes reached by De Quincey, and still less has he the thoughtfulness of Hazlitt, or the delightful, wayward humor and word-magic of Charles Lamb. He was a most active-minded man, who was busy with all kinds of writing but fell short of high distinction in everything.

Thomas De Quincey was one of the

mysteries of the literary world. Like Samuel Taylor Coleridge, he became early in life a victim of the terrible habit of taking opium, but out of that habit he drew the means of making his name known.

DE QUINCEY AND HIS AMAZING PICTURE OF AN OPIUM EATER

In his amazing Confessions of an Opium Eater he gave a vivid picture of a sensitive and imaginative man's experiences under the power of the drug. It stands quite alone as an example of English writing.

De Quincey wrote much and wrote well, almost to the end of his strange and uncanny life. Often he was in poverty, and lost to his friends, and then he reappeared—still writing—a shadowy, flitting figure, small, shriveled, with a yellow parchment-like face, without the power of keeping friendships, a care to all who had to do with him. At the age of thirty-six he wrote his most amazing book, and he lived thirty-eight years after writing it.

It may be said that The Confessions of an Opium Eater is too long to be classed with essays, but it is in the true spirit of the essay. In it the author saunters along with us and talks by the way, according to his whim. It is this freedom that induces so many to attempt the essay—it looks so simple. But then all depends on knowing what to say and how to say it, and that is very far from simple.

THE INDEPENDENT SPIRIT OF HONEST WILLIAM HAZLITT

William Hazlitt, the essayist who ranks next to his friend Charles Lamb, had more substance in his writing than had Lamb, but he had less charm, though his charm, too, was great. While Lamb was the most lovable of men, Hazlitt was one of the most three-cornered. In him independence was so strong as to be obstinacy. It led him to muddle his life, wound his friends and rush into headstrong follies. But he enjoyed it, and he died declaring that he had had a happy life.

The great thing that his independence of spirit did for Hazlitt was that it made him entirely honest. He could not do anything but express his real opinion, whatever others might think; and so all his opinions, right or wrong, are those of a strong, sincere mind, and deserve attention. And no man knew better than he the true taste of literature. What he loved he felt he must read aloud with infinite relish, and when he comes to you with it you feel he ought to be listened to, for it is bound to be worth hearing.

Hazlitt was a critic of books, of the stage and of art. He has never been surpassed in thoughtful appreciation of the theatre. He knew most of the men of his time who were best worth knowing, though he was an uneasy man to be friendly with. Such a man, varied, receptive, decisive, sensitive, must have had great richness in materials for essay-writing, and Hazlitt had the skill to use his materials. But for a certain harshness in his character he would have been a great man. As it is, he is a great essayist.

A MAN WHO KNEW HIMSELF AND KEPT APART FROM OTHERS

Though Hazlitt did not readily get quite near to men, he knew himself, and was satisfied with himself.

> What surprises me in looking back to the past is to find myself so little changed in the time. I have the same tastes, likings, sentiments and wishes I had then. The same images and trains of thought stick to me.
>
> Both from disposition and habit I can assume nothing, in word, look, or manner. I cannot steal a march on public opinion in any way. My standing upright, speaking loud, entering a room gracefully, proves nothing; therefore I neglect these ordinary means of recommending myself to the good graces and admiration of strangers. I have other resources, or at least am absorbed in other pursuits.

This brief extract from Hazlitt on himself may serve to introduce both the man and his style. What he cherished most in himself was what he called his unbendingness. His impressions of his own character are confirmed by all observers. He was an obstinate man. But then his ideas were, as a rule, so well considered and so unreservedly sincere that they were worth being obstinate about. They find expression in his essays in the clearest and best-chosen English.

And so we come round to the choicest of all the essayists, the heroic, gentle, whimsical Charles Lamb, delightful equally as man and as writer. Lamb, at once the richest and most delicate of all the humorists, lived all his life on the very edge of tragedy.

Mirth was as natural to him as breathing, but the family insanity was always lurking close by round the corner. Yet, though he saddened as the years went by, he must have had rich enjoyments all the

way. To all who know him he is an unfailing friend; but who so well as Lamb himself could appreciate the full flavor of his fanciful wit? He had only to dig for treasures in his own mind and nature and they were forthcoming in great richness.

CHARLES LAMB AND HIS BEAUTY OF EXPRESSION IN MANY MOODS

Charles Lamb is one of the writers who can never have his qualities pointed out by any description. He must be read. It would require a genius like his own to say in what his charm consists, and only by reading him can we catch the true delight of his style. Every fresh reading leaves us wondering which of his moods we like the best, whether his memories of school and work and holidays, or his sketches of types of men, as in Imperfect Sympathies, or his Bachelor's Complaint, or the twitting humors of his Distant Correspondents, or his Dream Children, or his delightful account of the origin of Roast Pig, or—and perhaps this is the best of all—his New Year's Eve, so tender and sad, so humorous and brave. If we want Charles Lamb, with all his beauties of expression revealing a gracious mind, we can get much of him in his lament on the flight of time in the New Year's Eve essay.

THE PASSING OF TIME AND THE GOOD THINGS OF LIFE

Not childhood alone, but the young man till thirty, never feels practically that he is mortal.

He knows it indeed, and if need were he could preach a homily on the fragility of life; but he brings it not home to himself, any more than in a hot June we can appropriate to our imagination the freezing days of December.

But now, shall I confess a truth? I feel these audits but too powerfully. I begin to count the probabilities of my duration and to grudge at the expenditure of moments and shortest periods like miser's farthings. In proportion as the years both lessen and shorten I set more count upon their periods and would fain lay my ineffectual finger upon the spoke of the great wheel. I am not content to pass away like a weaver's shuttle. These metaphors solace me not, nor sweeten the unpalatable draught of mortality.

I am in love with this green earth; the face of town and country; the unspeakable rural solitudes, and the sweet security of streets. . . . Sun and sky, and breeze, and solitary walks, and summer holidays, and the greenness of fields, and the delicious juices of meats and fishes, and society, and the cheerful glass, and candle-light, and fire-side conversations, and innocent vanities and jests, and irony itself—do these things go out with life?

Can a ghost laugh, or shake his gaunt sides, if you are pleasant with him?

There you have it. Charles Lamb was "pleasant" with men and with life in all its phases. He could be serious indeed. What passage in our literature is more serious than that? But then he turns aside and is pleasant, even with the world of spectres. No one else has such ease, with constant unexpectedness, and a quaint old fashion that has depth and beauty as well as grace. As an essayist he stands alone. He ranges from grave to gay, but not from lively to severe; for, though he had many moods, his fight against sorrow was never marked by severity toward his fellow-men.

TO TRAVEL HOPEFULLY IS BETTER THAN TO ARRIVE

The one modern essayist who hovers near the class of Lamb and Hazlitt is Robert Louis Stevenson, who was much else besides an essayist, but as an essayist reached the level he reached as a romantic story-teller and as a haunting poet. He, like Lamb, had the consolation of humor, while fighting a long battle with the tragedy of ill-health. He, like Lamb, bore himself gallantly in the spirit of the closing sentences of his Essay on El Dorado:

O toiling hands of mortals! O unwearied feet, traveling ye know not whither! Soon, soon it seems to you you must come forth on some conspicuous hill top, and but a little way farther, against the setting sun, descry the spires of El Dorado. Little do ye know your own blessedness; for to travel hopefully is a better thing than to arrive, and the true success is to labour.

It would have been better if there had been hope rising above that note of endurance, but Stevenson was very ill when he wrote that fine passage, and was not expecting the twelve years of active and fruitful life that followed it before his death in the mild-aired South Sea Islands.

Robert Louis Stevenson was born in Edinburgh on November 13, 1850, and his father, his grandfather and his uncle were all celebrated builders of lighthouses. Stevenson was very proud of his ancestors, as he might well be, for it is surely a fine work to set up these wonderful towers along the coasts to light the sailors safely home to port through the dark night. It is very likely that the romance connected with the building of these mighty beacons of the sea had much to do in kindling the love of romance in Stevenson himself, which was to result in his writing some

of the finest romantic stories published in the latter half of the last century.

Stevenson was a weak and ailing child, and, had his parents not been well supplied with money so that they were able to give him the greatest care, taking him to healthful places and constantly watching over him, he might never have grown to manhood. Though feeble in body, he was always strong in mind and brave of heart, and he could show when the time came that he could not only *write* of brave deeds but that he could *do* them also. He believed that happiness was one of the things that men were sent into the world to achieve.

> If I have faltered more or less
> In my great task of happiness

he says in a poem, and explains elsewhere:

> To be truly happy is a question of how we begin and not of how we end, of what we want and not of what we have. An aspiration is a joy for ever, a possession as solid as a landed estate, a fortune which we can never exhaust and which gives us year by year a revenue of pleasurable activity. To have many of these is to be spiritually rich. Life is only a very dull and ill-directed theatre unless we have some interests in the piece; and to those who have neither art nor science, the world is a mere arrangement of colours, or a rough footway where they may very well break their shins.

ROBERT LOUIS STEVENSON AS AN AUTHOR AT SIXTEEN

He resembles Sir Walter Scott in having done nothing of note either at school or university; but while he seemed to be wasting time he was in reality preparing himself for the work of his life by reading widely all the books we do not get at school and by imitating the styles of different authors, until he had formed for himself a manner of expressing his thoughts or telling his tale which is far more charming than that of any other author of his time. He was only sixteen years of age when he wrote a description of a historical event in Scotland, The Pentland Rising, and this was published as a little booklet.

His first real books were little stories of travel on the Continent, An Inland Voyage and Travels with a Donkey in the Cevennes, but it was with that most delightful tale of adventure, Treasure Island, that his name first became popular. He next wrote Kidnapped, a story that will long be the delight of old and young alike; and he was a charming poet, too, for no one has excelled him in expressing in verse the delights of childhood, as he has done in his famous book A Child's Garden of Verses.

His wild and symbolic tale of The Strange Case of Dr. Jekyll and Mr. Hyde was very popular. In it Stevenson illustrates by the development of two personalities in an individual the higher and the lower natures of man.

Ill-health pursued Stevenson all his days; and it is wonderful to think that he was able during his short life, and racked by illness so often, to write so many fine stories, essays and poems that a complete edition of his works requires no less than twenty-eight volumes; and every page he wrote has a charm all his own, for he never slighted a single sentence. Though at present we shall probably like Treasure Island and Kidnapped very much, later on we may come to admire his essays even more.

HOW THE WRITER OF KIDNAPPED WAS BURIED ON A SOUTH SEA ISLAND

When he was thirty-nine years of age he could no longer fight against the severe winters of his native land, and, with his wife and two stepchildren, he built himself a strange house far away on the lovely island of Samoa in the Pacific Ocean. There for a few years he lived and worked, attended by native servants, the friend of Samoan chiefs, who loved him as a brother. When he died suddenly, on December 3, 1894, sixty sturdy Samoans who acknowledged Stevenson as their chief cut a way through the thick bush and reverently carried his coffin to the top of the beautiful mountain he had loved to look upon from his Samoan home. And there he lies with the Pacific Ocean at his feet under a tomb on which these verses, written by himself, are engraved:

> Under the wide and starry sky,
> Dig the grave and let me lie.
> Glad did I live and gladly die,
> And I lay me down with a will.
>
> This be the verse you grave for me:
> "Here he lies where he longed to be;
> Home is the sailor, home from the sea,
> And the hunter home from the hill."

After his death the chiefs forbade the use of guns near the mountain-top where his body rests, so that "the birds may live there undisturbed and raise above his grave the songs he loved so well."

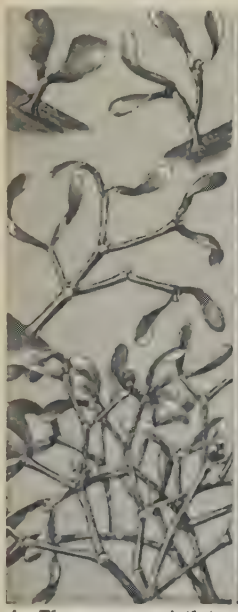
THE NEXT STORY OF LITERATURE IS ON PAGE 3201.

THE LIFE-STORY OF THE MISTLETOE

1. Above is a mistletoe berry, and under it sections showing the seed. Below, seed magnified.

2. This picture shows how the mistletoe spreads. A thrush has been eating the berries, and is cleaning its beak on a tree to which it has flown. In the process seeds stick to the branch.

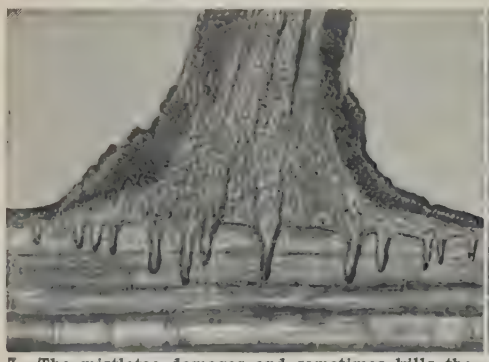
3. The seeds germinate and put out rootlets which bore into the bark, as in the lower picture.



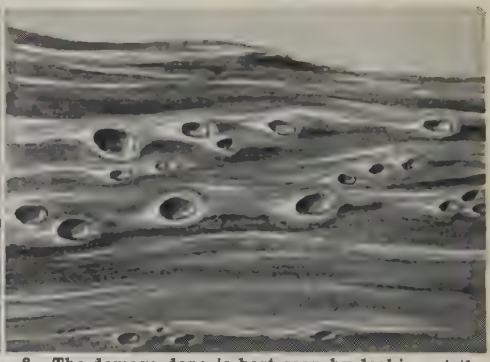
4. The young mistletoe grows, and here are four stages of development.

5. The mistletoe is probably found more often on the apple tree than on any other, and here we see an old apple tree with mistletoe plants growing on it.

6. The upper picture shows the female flower and below the male.



7. The mistletoe damages and sometimes kills the branch on which it grows. This picture shows how the rootlets penetrate the stem of its host.



8. The damage done is best seen by looking at the wood of a tree on which it has lived. Here is a piece of fir with the holes made by mistletoe.

Signs and symbols made on the rocks by the Stone Age men of Australia.

WHO BEGAN TALKING AND WRITING?

CONTINUED FROM 2720

SOME people have supposed that there must have been a time when man did not talk, and so they have given a special name to men of that period. But we may be almost sure that they are wrong; we may believe that human beings have always been able to talk. The lowest kinds of human beings now living certainly talk.

But we know that apes and some other kinds of animals are able to make one another understand, and it is certainly probable that the earliest men had a language. Indeed, many people think that speech is the thing that makes man what he is. They would say that mankind depends upon the ability to talk. Another way of saying this is that we could not call beings human who had not the power of speech in some form or other. Such beings could not teach each other from generation to generation as human beings do, and, in a word, they would be only animals.

But of course men did not always write. Writing is a form of speech, only written instead of spoken, but it is very much more difficult to learn, as we all know; and if we think for a moment, we shall see that it must have been much more difficult to invent than speech. Indeed, a simple kind of speech scarcely required invention at all, for it could grow out of mere noises that meant pleasure, or anger, or distress. But writing requires invention. It needs people to agree with one another that certain marks shall mean certain things; and this is true even though we know that writing grew out of simple pictures of things like the eye, or a man standing, that anyone could recognize.

We do not think there can be any doubt that, just as we all can talk and understand what other people say long before we can write, so mankind could talk long before writing was invented. Who first began to write, however, nobody can possibly say. We have evidence of the existence of human beings who have left us rude pictures scratched on bones, for instance, but no signs at all of any kind of writing. Indeed, "man before writing" was, until lately, supposed to have lived in Europe not many thousands of years ago; and though we now know that writing goes back much farther than we used to think, we can guess fairly well about the time that it was invented. Many people will agree that it was easily the most wonderful invention of all time.

IS THE WHITE OF THE EGG PART OF THE CHICKEN?

The white of the egg, and nearly the whole of the yolk, too, are not part of the chicken, but what it feeds on. If

we look at an egg that has just begun to develop, we can see on the surface of the yolk the little thing that will be the chicken; and a day or two later we can see tiny little blood-vessels spreading out from this point over the yolk to help themselves to the food in the yolk. Afterward the white of the egg is also eaten up. The white of an egg consists of albumen and water. Albumen means the *white* thing.

This egg-albumen is not the same as the albumen in our blood on which our bodies feed, but it is very similar. When it is eaten up by the developing chicken, or when we eat the egg, this egg-albumen is changed by digestion into the blood-albumen of the chicken or of ourselves, as the case may be. As nearly all the egg is nourishment for the young creature that is to develop, different kinds of eggs vary very much in size quite apart from the size of the creature that is to develop from them. Some creatures are born from eggs which contain no nourishment, as the nourishment is supplied in other ways, and such eggs may be so small that they can be seen only through the microscope.

Is mistletoe harmful to the trees on which it grows?

Yes; it does much harm to the trees on which it grows as a parasite, and sometimes kills them. Contrary to the popular idea, it is very rarely found on the oak. It is more commonly seen growing on the apple. It also grows on the pear, the hawthorn, fir, poplar, sycamore and lime; and in the Himalayas is generally found on the apricot and vine.

The seeds are spread by birds, which, after eating the berries, clean their beaks on the branches of a tree, and the seeds become attached by the viscid, or sticky, matter from the berry. The seed germinates and the roots bore down through the bark into the wood of its host, from which the mistletoe draws all its water supply and mineral foods, though by means of its green leaves it takes some carbon dioxid directly from the air.

Not only does the parasite steal nourishment from its host, but by causing an undue flow of sap or by preventing the proper flow in the stock, it may eventually cause the death of the branch or tree on which it grows. That, of course, means also its own destruction.

The mistletoe undoubtedly injures its host by allowing insects and fungi to find an entrance at the swollen places produced by its roots. Apple orchards in some districts suffer from the pest. The life-story of the mistletoe is shown on page 2870.

Why are not all diseases infectious?

What we call infection is due to the presence of a vast number of tiny living cells called germs or microbes or bacteria. These little creatures are so small that it requires very high magnifying powers in a microscope to see them. By their action on the living tissues of plants and animals many diseases are produced. These germs are so small and so light that they can be carried about in the air or they may get into the water. They may contaminate the atmosphere or our food, and so spread disease wherever they go. That is what is meant by carrying infection. For instance, the germs which cause typhoid fever or diphtheria often get into a milk supply or a water supply, and so cause an epidemic among the people who use that source of drinking water or milk.

There are many diseases which are not infectious, because they are not caused by such germs. For instance, many diseases are due to various forms of violence and pressure. This may be caused by lack of blood or by blood's being stopped from circulating properly. Still other diseases are due to various chemical substances which act as poisons upon the tissues of the body, while others are the result of extremes of heat and cold. All these concern only the individual, and are not capable of being transmitted to somebody else, as are the diseases caused by living creatures.

Why is it good to boil potatoes in their jackets?

It is good to boil potatoes in their jackets because most of their potassium and other salts are to be found chiefly in the cells under the skin, and so are thrown away when the potato is peeled. Not only so, but it seems probable that most of the valuable substances named vitamins are also collected chiefly under the skin, and so also are wasted with the parings.

Why does a rope not lie straight when thrown on the ground?

If we can imagine a rope made of sand, and if we could throw such a rope on the ground, it would lie straight. The mak-

ing of a rope depends on something which will always prevent us from throwing it so that it will lie straight when we have made it. We can make a rope only of something that will hang together if there is some kind of pull between the particles that make it. If there is no such pull, there cannot be a rope.

If we take a shovelful of sand and throw it out from us, it will fly out in nearly straight lines; but when we throw out a rope, we are throwing something of which the molecules are wonderfully bound together in ways which are beyond our understanding. Their pull on each other prevents the rope from flying out in a straight line. Perhaps this would not be so if it were possible to make a perfect rope, of which all the parts pulled equally and truly and evenly, and if we could throw this rope out in such a way as to give no bias to any part of it—a thing it is impossible to do.

WHY DO WE GET HEADACHE IN A CROWDED ROOM?

We get headache in a crowded room only if it is badly ventilated, and many people think that the cause of the headache is the accumulation of carbon dioxid from many lungs. But carbon dioxid rarely occurs in sufficient quantity to do much harm, and we really get a headache in a crowded room for much the same reason that we get a headache in thundery weather—simply because the air is at once still, warm and moist.

In a crowded room we have many people whose bodies are giving off heat continually, and the result is that, unless the room is well ventilated, the air becomes very warm and wet. In such a warm, wet atmosphere neither heat nor moisture can readily escape from the body, and this leads to discomfort, and also to reduced activity of the lungs and the heart. The skin is not acting as it should, the lungs and heart are not acting well; the body becomes feverish and half poisoned; and naturally a headache follows. If the room were not crowded, the people could walk about and make a little breeze round themselves, and so escape from the heat and moisture accumulating under their clothes; but in a crowded room even this slight relief is denied them. Increase of carbon dioxid and reduction of oxygen may also help to cause the headache; but the main cause is the wetness and warmness and stillness.

WHY ARE SOME THINGS NOT GOOD FOR CHILDREN?

The truth of the matter is that many things which are bad for children are not very good for grown-ups; but it is true that things which would injure children very much may not hurt grown-up people. There are three reasons for this. One is that the bodies of children have not so much resistance to harmful things as grown-up bodies have. Another reason is that the body has the power of learning to protect itself against harmful things. In many cases grown-ups are able to take these things without much injury because their bodies have learned how to do so. Even a grown-up taking tobacco for the first time is likely to suffer severely.

But the third reason is the most important. It is true of all kinds of living beings that they are more easily injured when they are developing. We can understand in a way how this must be, for developing is a much more delicate and difficult process than merely continuing in the same state, which is all that the grown-up body has to do; and so we may expect that the developing body must be more delicate. It has only one way of going right and many ways of going wrong. Only those who have studied development can understand how grave is the effect of poisons like alcohol and tobacco on the developing body of a child.

WHY DOES IT NOT HURT WHEN WE CUT OUR HAIR?

We feel pain when we suffer from any kind of injury because almost every part of the body has innumerable small nerves in it, which carry to the brain the sensation of pain. It follows that if there were no nerves there would be no pain; and, as a matter of fact, when a doctor wishes to do anything to a patient which would be very painful, he uses some means to deaden the endings of the nerves in the skin. It happens that our hair, like our nails, has no nerves, and therefore may be cut off in nearly every case without causing any pain.

HOW IS A VOLCANO FORMED?

Volcanoes are made by the heat inside the earth. But why does that heat behave as it does? And is the heat made in any special way when the volcanoes are formed? It is certain that at its very beginning a volcano is a hole in the surface of the earth's crust. Once that hole

is made, we can understand how the heat underneath goes on using it; things naturally find their way out through it because it is the path of least resistance, and so a pile of stuff is heaped up round it. But the whole earth is hot. Why did the hole, in the first place, form just there? There are two answers. The first is that probably the earth's crust at these places is thinner or weaker, or made of material that can more easily be pierced; and the second answer is that possibly special sources of heat and power lie underneath it, owing to the presence of rocks or materials which contain more than their share of the wonderful element radium, or some other heat-producing element like it.

WHY DOES SHALLOW WATER FREEZE FIRST?

When the air is very cold, it gradually takes heat away from the water which is exposed to it, and so that water becomes colder. The earth beneath the water is much warmer, as a rule, than the freezing air, and so we expect to find the coldest water at the top, where the heat is being lost, and the warmer water below.

When water is cooled from 4° Centigrade down to the freezing-point, it does not get heavier and sink, as we should expect; if it did, a pond would freeze from the bottom upward. On the contrary, it gets lighter and floats, and so a pond freezes at the surface. But, short of cooling the water down so near to the freezing-point as 4° Centigrade, the water is becoming heavier all the time it is cooling, and, being heavier, it must sink, while the warmer water takes its place at the top.

This means that the whole thickness of the water must be cooled down before any of it will freeze, and therefore the shallower the water is, the quicker it will freeze. The little puddle in the road freezes quickly, but the deep pool will not begin to freeze until the whole depth of its water has been cooled.

WHAT DO WE MEAN BY THE ETHER?

Ether is the chemical name of a sweet-smelling liquid, made of carbon, hydrogen and oxygen, which, like chloroform, produces a kind of sleep for surgical operations. But when we speak of *the* ether we mean something different. Of course we should have two different words for the two things, but we have not.

The word has been used to mean the blue heavens or the upper air. But now it is known that the term has a wider meaning. In fact, we could say with truth that air is ether and spaces we have called empty are really filled with ether.

If we understood the ether, we should have the key to almost every puzzle we find in nature. We know very little about it, but we are sure of certain facts. The ether is *everywhere*. It cannot be seen, yet we may say that we see nothing else, for light is a state of the ether, and light is the only thing we can see.

Both light and heat travel in waves, so there must be some medium in which such waves can travel. Scientists call this medium ether. You also know that radio waves travel through the ether.

The ether has no weight, yet it is the cause of weight; for weight is due to gravitation, and it is through the ether that gravitation acts. And some believe that matter is really made of the ether—that the electric particles, or electrons, of which the atoms of matter are composed, consist of things in the ether which we can only dimly picture to ourselves as knots or lumps of ether. Though we do not know how, it is possible that the ether is the mother of all matter and of all material things; that it is the element of elements, and we cannot pierce behind it to anything except the Author of all that is.

HAVE THINGS ANY COLOR AT NIGHT?

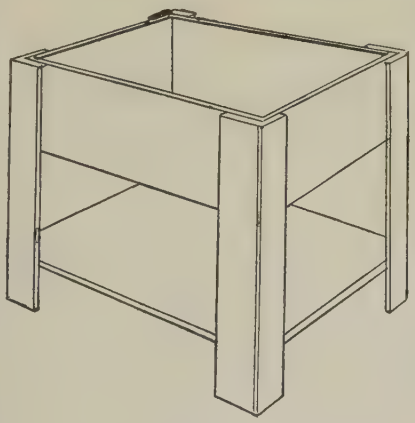
When we say color, we mean colored light, light that gives us a feeling which we call color. A non-luminous thing may have color at night if there is light in the room. So now we can put the question thus: Have non-luminous things color in the dark? The answer is: Certainly not. An orange is yellow because when yellow light (or white light containing yellow light) is thrown upon it, it has the power of throwing the yellow light back, and so we call it yellow. If no light falls on it, it can throw no light back, as, unlike the fire, it produces no light of its own; and so, of course, it has no color in the dark, nor has anything else that does not produce light of its own; and if it did produce light, it would not be in the dark. In a word, what we call color is a kind of light, and where there is no light there can be no color.

THE NEXT WONDER QUESTIONS ARE ON PAGE 3009.

MORE FURNITURE FROM PACKING BOXES

CONTINUED FROM 2746

IT is hard to decide which of these articles to make first. Shall it be the flower stand, the shirt-waist closet or one of the others? It certainly is not easy to choose, for they are all attractive, and we shall want to make them all in time. We are becoming skillful workers, for our journey into Box Furniture Land has given us experience with many articles. We have directions for a scrap box, a footstool, a general-utility box, among other articles, and now we shall attempt some pieces of furniture which are just a little more difficult. The distinctive feature of our furniture is the corner brace, or trim. And this, we remember, is always made by placing the face of the wide strip of wood at right angles against the edge of the narrow one. Full directions are given under each article, so there will be no difficulty in making them.



"Hurrah for Billy," said Mother, when her son presented her with an artistic flower stand with a plant on it, as a surprise for her birthday. "For a long time I have wanted just such a place for my geraniums, and now I have one that is made so nicely." "I knew you would be surprised," replied Billy, "because we have kept it in the garret and worked on it while you were away, and all the materials and the plant were bought with the twenty-five cents you gave me for having a good report card." "How did you make it?" asked Marjorie, his cousin, who was visiting him. "I wish I could make one for my mother, too."

"It's easy enough," said Billy. "I'll tell you.

"The grocery boy brought his order one morning in a good-looking candle box, and I asked him to leave it. He did so. Then I went to the carpenter's shop around the corner and asked him for material for the legs. As the box was 14 inches square and 7 inches deep, I needed four strips $\frac{3}{8}$ inch thick, $1\frac{1}{4}$ inches wide and 9 inches longer than the outside depth of the box; and four more strips $\frac{3}{8}$ inch thick, $1\frac{1}{2}$ inches wide and 9 inches longer than the outside depth of the box. Besides this I needed two pieces for cleats to strengthen the shelf, and so asked for two strips $\frac{1}{2}$ inch thick, $1\frac{1}{2}$ inches wide and 14 inches long."

"It's the easiest thing in the world to make," said Billy, "but I'll write out the directions for you, so you will not have the least bit of trouble." So Billy wrote down on a large piece of paper just the way that Marjorie ought to make the flower stand. And here is what he wrote:

"Take the cover off the box. Don't sit on it, for you will want it in a jiffy. Use a tack-claw in pulling out the nails. Don't split the wood by jerking them out in a hurry.

"Get your big sister Nan to help you on the next part, because two can have more fun than one. Here's the leg job.

"Put the four narrow strips in one pile (No. 1), the four wide strips in another group (No. 2). Take a narrow strip from pile No. 1. Put it flat down on the floor in

front of you. Take a wide strip from pile No. 2. Stand it up straight on one edge, bang up against No. 1 but not on top of it. That's what you call a right angle. You'll know that when you study geometry. Now then, Marge, while Nan holds the two pieces together, hammer the nails in. That makes one leg. Make three more just like that. That stunt is done. Hurrah!

"Turn the box on its side. Let Nan hold one leg in place, keeping the upper end even with the open top of the box, while you get busy with your hammer and nails. Nail on all legs.

"Now, where's your cover? Find it and plane off the good-looking side. Turn it over and nail on two strips for cleats on the wrong side. Call it a shelf.

"Turn your stand upside down; set the shelf in place, making it 4 inches from the end of each leg. Put two nails through each leg into the edge of the shelf. Don't let the shelf slip while you drive your nails.

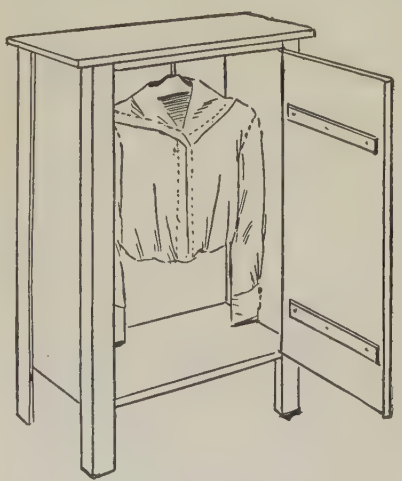
"So far so good. Take a piece of coarse sandpaper and rub the stand all over; then take a piece of fine and give the finishing touches. Now for a small can of Jap-a-lac. All girls love to flourish a paint-brush. Put on one coat and let it dry over night. Then sandpaper it a bit and apply a second coat.

"Now, then, your job is done. So give a war-whoop, and dance a jig around your flower stand.

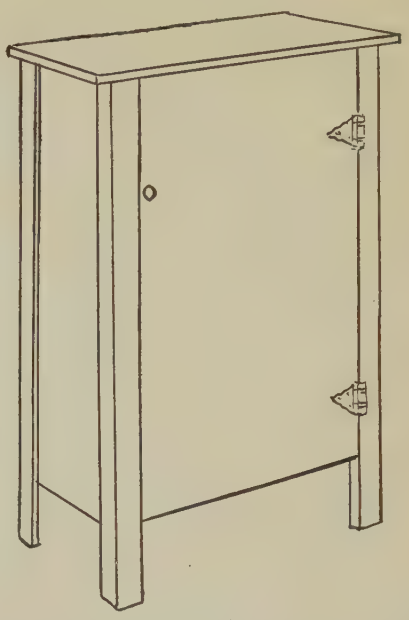
"Perhaps you can get a pan which will just fit inside, so that if water slops over it will not make the bottom wet so that it will warp."

A SHIRT-WAIST CLOSET

A SHIRT-WAIST closet is quite an inexpensive bit of furniture, and yet it is very useful and attractive. The carpenter lad in his work must not forget his big sister who sometimes helps him in his studies, nor the



good mother who constantly takes many stitches for him. So this chest is something which the boy can make especially for his grown sister or his mother, and he may be sure that it will be appreciated. It is a novel idea to have a special closet for blouses to keep them fresh and clean. A bureau drawer is the usual place to keep waists, but very often the blouses get crumpled, mussed and wrinkled. A shirt-waist closet would delight the heart of a



schoolgirl, and it certainly is not hard to make, starting with the box as a foundation. Girls who have not a big brother can get to work and surprise their friends with their carpentering ability.

The packing box necessary should be about 12 inches deep, 22 inches wide and 34 inches long. If you prefer, you may find a box that is deeper so that it will hold several more blouses.

The door is made from the cover of the box, but you will need door-cleats, or strengthening pieces, consisting of two strips ½ inch thick, 1½ inches wide and 4 inches shorter than the outside width of the box.

The top should be a piece of wood ½ inch thick, 3 inches wider and 3 inches longer than the outside width and depth of the box.

Again you need to go to the hardware store, and this time you want two 1½-inch T hinges and screws, one porcelain pull-knob, one brass button and screw, six wire hooks, and six coat-hangers.

The last thing needed is material for the legs. Four of the strips required should be ½ inch thick, 1½ inches wide and 4 inches longer than the outside length of the box; the other four strips should be the same thickness and length, but 2 inches wide.

You may think that a closet is more complicated to make than the articles which you have already made, but in reality it is very simple to construct. By this time you have become an expert in the matter of making the legs, which is the distinctive feature of this style of furniture, so you will hardly need to be told how to make them. Just remember

that the legs are 4 inches longer than the outside length of the box, and that they should be carefully planed and smoothed with sandpaper so that they will take a good finish. Remove the cover from the box; turn the box on its side and nail on two of the legs; then reverse the box and nail on the other legs. Nail the cleats on the back of the cover, which now becomes the door. Remember that the door is to swing between your strips and it must therefore be narrowed to fit by sawing off a strip 3 inches wide, or the same width in two strips. If you want to know why cleats are used, see page 2377 (in the article on joints). Place the hinges between the edges of the door and the leg, and hang the door. Turn the closet right side up, stand it on its legs, and nail on the top, letting it overlap the edges the same width all around. Screw the six hooks into the under side of the top at the centre of the closet and place a coat-hanger on each hook.

After an application or two of paint or varnish the closet is ready for use. Just make one for sister, and see how pleased she will be, for next to curly hair, there is nothing that a girl so much desires as pretty things for her room.

A SIMPLE BOOKCASE

OF the many attractive and useful articles which a boy can make for his own room, or in fact for the library, or for his father's den, a simple bookcase, like the one illustrated here, will well repay him for his time and energy. Every boy likes to have his own books kept

together, and takes pride in adding to his collection of good books if he has a suitable place to keep them. How many boys own a bookcase which is really their own personal property? Not many boys, perhaps; but here is a bookcase that every boy can own, because he can make it himself at very little expense. It is much more fun to make things than simply to walk into a store and select something ready-made. Then there is another advantage in making furniture, for the maker may have the articles as large or as small as he pleases, to suit the space in his room, and he may finish the articles to harmonize with his color scheme. Of course when "boys" is used, that includes the girls, for the girls are often quite as capable in using a hammer and saw as the boys. And this is a secret which must not be told or the boys may be jealous: some girls are better carpenters than the boys!

Of course the first thing you need is a box. This time you want a great big packing box, or canned-soup box. It does not matter whether the grocer calls it a soap box or a cereal box, as long as the size is right, and you must ask for a box about 12 inches high, 10 inches deep and 25 or 30 inches long. You need three boxes just alike in size and shape.

For the legs you need four strips ½ inch thick, 1½ inches wide and 4 inches longer than the height of the three boxes combined, and four more strips of the same thickness and length, but 2 inches wide.

For the top you will need one piece of board about ⅝ inch thick, 3 inches wider than the outside depth of the box after the cover is removed, and 3 inches longer than the outside length of the box. For the facing strips for the sides you must have six strips ½ inch thick, 1½ inches or 2 inches wide and about 7 inches long.

The materials may sound confusing, if you read them in a hurry; but if you follow the directions one step at a time, you will be surprised how easy the work will be. First of all remove the covers from all three boxes, and smooth off any rough edges, planing them down so that they are all three the same depth. Then take two of the boxes and place them so that they are open toward you, and nail them together. Stand them up and place the third box on top, nailing it on also, keeping the open sides facing the same way.

Make the legs in the usual way, by joining a wide and a narrow strip. Nail on the four legs, keeping the upper ends even with the top side of the last box. Place the stand upon its legs, and nail on the cover for the top, letting its edges project 1 inch over the outside face of the legs all around.

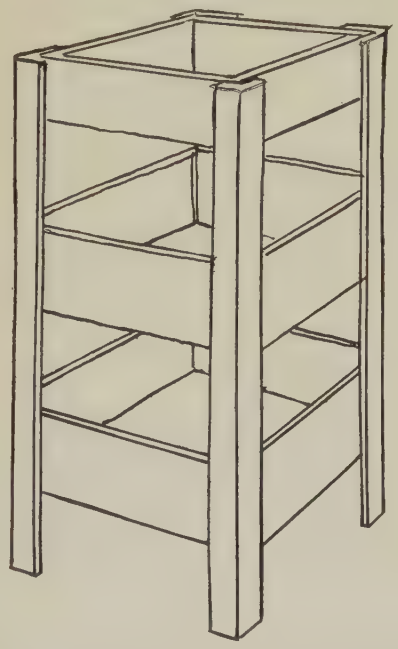
Now you are ready for the facing strips at the ends which are used to cover the seams where the boxes are joined and to give a neat finish. Look at the picture to see just where the three strips are placed at one end. Nail the three strips on one side, and make the other end to correspond. Now your bookcase is complete and ready for the varnish or stain.

If you wish to make the bookcase look even better, follow these directions. Before applying the varnish you may give your work a neater finish if you add three narrow strips of wood, each the length of the bookcase, between the front legs, and just wide enough to conceal the edges of the boxes. Nail these three strips in place, taking care to keep them exactly over the edges.

ODDS-AND-ENDS STAND

THIS stand will be found a convenient receptacle for all kinds of small articles, and will be useful in almost any upstairs room. In the boy's room, it will serve as a place to keep some of his smaller toys and games; in his sister's room, it will prove an attractive sewing stand; in the nursery, it will make an ideal stand for the baby's playthings and necessary medicines. There are countless ways of using this bit of furniture. Boys and girls who are handy with tools can see how nicely and quickly they can make this model.

Just as a good cook gathers all her required utensils and materials before starting to bake



a cake, and a general summons all his troops before going to battle, so the efficient carpenter mobilizes his forces before setting out to conquer. In this case, the carpenter's boxes are the veteran forces, and the rough boards his raw recruits, which must be trained and drilled into serviceable material.

The carpenter-captain selects good sturdy boxes that will withstand the wind and weather, discarding any battered or fragile boxes which look as though they had been through the war. The ideal box for this purpose should be about 8 inches high, 14 inches long and 12 inches wide. Three boxes of the same strong build will be sufficient. Four thin strips of board about ⅜ inch thick, 1⅛ inches wide and 40 inches long will serve as part of the legs, and four more strips ⅜ inch thick, 1½ inches wide and 40 inches long will be needed for the other section.

Nail together a wide and a narrow strip to form the leg, which should be about 40 inches long. Measure to see that all four legs are the same length. Take the three boxes and remove the covers. Turn one of the boxes on its side and nail on two of the legs, keeping the upper ends of the legs even with the top of the box at its open end. Take another box and place it on its side, allowing the legs to project 4 inches beyond the bottom of the box, and making the open top of the box face in the same direction as the open top of the first box. Measure the space between the top and bottom box, and locate the third box at an equal distance between the two. Nail the legs to this centre box. Turn the three boxes upside down, and nail the other two legs on the opposite side, measuring carefully to see that the boxes are equally spaced as on the first side.

The stand is completely built and ready for the finishing touches. A can of varnish or stain will work wonders on the appearance of the article. A yard or two of dainty muslin or figured cretonne, pleated and nailed at the edge of the top box, will give a pretty touch to it if sister is going to use it as a working or sewing stand. Work out your own idea as to the color scheme, and it is surprising how pretty you can make such a simple thing as an odds-and-ends stand.

This same design would be useful in a sick-room as a medicine table. You know that at one time or another there is illness in nearly every home, and at such a time a stand like this would save the time and strength of the nurse or those looking after the invalid. For right here on this stand the medicine bottles may be kept with no danger of falling off, and the breakfast tray may be placed on the top within convenient reaching distance of the patient.

So, you see, there are many different uses for this little stand, and you will be proud of the fact that you yourself fashioned it.

A REFERENCE STAND

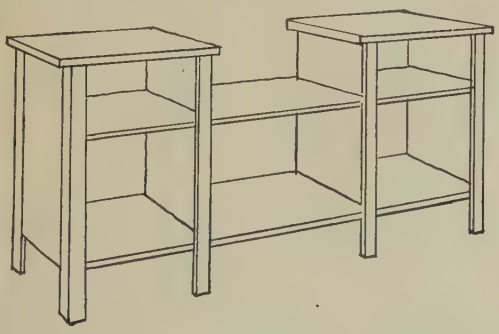
THERE are a great many things that a boy can make for the general use and convenience of all the family, and when he makes his articles out of boxes he is especially pleased with the good results he may obtain at very little expense. Nothing that the handy boy might make would be more appreciated than the reference stand shown in the sketch. For a boy's room it would prove a veritable treasure-chest in which to keep a great variety of toys and games. One shelf might hold his tops and balls, another his camera, films and photographic materials, while the lower compartments will be large enough for a tennis-racket, boxing-gloves, or even his tools and electrical equipment. The middle compartment could be provided with a hinged door and a lock, and here the lad may keep under lock and key his special treasures. If any further uses for this handy stand were mentioned, every boy, and some girls too, would immediately set to work to make one.

You may persuade your amiable friend the grocer to part with three good Kirkman's Borax Soap boxes, for if he is as abundantly supplied with soap boxes as most grocers are, he will be grateful to you for removing some extra boxes which are only in his way. However, if he has not many superfluous boxes, he may ask five cents for each box. Any box will do that is about 11 inches deep, 15 inches

wide and 25 inches long. This size is not compulsory but is convenient. Be sure that the three boxes are alike in dimensions.

For the legs you need four strips ⅜ inch thick, 1⅜ inches wide, 6 inches longer than the outside length of the boxes; and four more strips ⅜ inch thick, 1¾ inches wide and 6 inches longer than the outside length of the boxes.

Two top boards will be needed, each piece ½ inch thick, 2 inches wider than the outside



depth of the box with the cover removed, and 2 inches longer than the outside width of the box.

Besides the legs, it will be necessary to have four facing strips for the inside supports, and these pieces must be ⅜ inch thick, 1¾ inches wide and 6 inches longer than the outside length of the long boxes.

Make the legs first, and see that they are 31 inches long, or 6 inches longer than the length of the boxes. Then remove the covers from the three boxes. Take off one end from each of two of the boxes, reserving these ends for use later on as shelves in these boxes. Stand these two boxes upright on end, placing the third box lengthwise on its side between them. Mark the right height for the shelves, so that they will be level with the top of the middle box which is placed on its side. Nail the two shelves in place at this height. Now fasten the three boxes together, taking care that the open compartments all face the same way. Study the picture before you start to nail, and you will see just how the boxes are placed. Fasten on the four legs, one on each outside corner, taking care that the upper ends are even with the top edge of the end sections of the stand. The two top pieces may now be placed on the end sections, so that each top projects ⅝ inch over the outside face of the legs at the front, rear and end. Nail on the four inside facing strip legs, two on the front, and two at the corresponding points on the rear side, so that the joints between the boxes are covered. As usual, sand paper, putty up any cracks or imperfections, and varnish in the color you prefer.

THE THINGS YOU HAVE LEARNED

YOU have now learned a great deal about the possibilities of the ordinary boxes you can get from the grocer, and how they can be transformed into both useful and ornamental pieces of furniture. You have been told about the tools, and how to use them, have learned of the materials needed, and have been told the way to use stains and varnishes to make your work look better.

Your first effort, you remember, was the miniature plant box, which is made so easily, and yet looks so well. You followed that with the scrap box, which was a little more difficult, and showed how, with a little more work, it could be made into an attractive hanging flower box. This was followed by another scrap box, which could also be used as a hanging lantern for a veranda or a hallway. The footstool which came next was really no harder than some of the things you had done before, though you were told how you might make improvements on the simple design if you chose.

Your next group of designs was more difficult, for here you began to take your boxes apart and change their shapes, or to put on hinges and handles. The general-utility box is easy, if you are careful, though of course if you put a cushion on the top, you must not make any mistakes. The useful blacking box requires some care, but the result is worth all the trouble. No article described is more useful than the small wall-rack, which you can make any size desired.

The articles described above in this last section are rather more difficult to make than the earlier ones, but if you have practiced on those which are shown before, you will have little trouble. The flower stand is easy, but the door of the shirt-waist closet is nice work. The simple bookcase needs only attention to the directions and the same is true of the odds-and-ends stand. The reference stand is put last, and should not be tried until you have made some other things.

When you have made these, there is no reason why you cannot make more difficult pieces.

SOLUTION TO THE PUZZLE OF THE SECRET LOCK

WE read on page 2741 how a rich man, who wished to preserve his valuable vessels safely, made a safe and fastened it securely with a lock which would only open when three pointers on three dials pointed to three different letters which formed an English word. Knowing this, we thought that it might be possible to find out the word, and this is the way the word can be thought out.

Every English word must have at least one vowel, or otherwise we could not pronounce it. When we look at the dials we find that the only vowel that appears on them is the letter Y, and therefore we know that this letter comes into our word. No English word begins with a Y and has the two following letters consonants. Also, all the words of three letters which begin with two consonants either begin with an S or have H, L or R as their second letter. But these four consonants do not appear on the dials. Therefore, Y must be the middle letter of our word, and going very carefully through the consonants on both dials and placing them before and after Y, the only word which is made is "pyx," which is the name of a little vessel used for religious purposes.

WHAT ANIMALS ARE THESE?

THE GAME OF "WHAT IS ITS NAME?"

WE have given many questions which we can read out to our friends for them to answer on pages 2168 and 2742. Now here are some more puzzle questions, which deal with some of the animals that are described in the sections on Animal Life in this book. The answers are to be found on page 3023.

THE LITTLE CREATURE THAT IS MORE CLEVER THAN MAN

1. In our garden there is a beautifully made little creature which can do things no human being can do. It makes out of its own body a rope strong enough for it to walk on, yet so fine and straight that it is used in making the most delicate optical instruments. So thin is it that one hundred of its strands make only the thickness of a hair; so strong that it serves as a net to entrap prey, and can withstand rain, wind, frost and heat. See, here is one of our little friends up in the attic. It has four pairs of legs, a body in two pieces, and eight little eyes, so no wonder it can see all about it. What do you think it is named?

THE ARMOR-PLATED OLD MAN OF THE GARDEN

2. We find a very different animal hidden away under the lettuces. He has had one hundred and fifty birthdays and may have many more yet, for he takes life easily. He always carries his house with him. It is made of hard bony plates and a flat breastplate underneath, leaving a space in front for his head and two legs to peep out, and another at the back for his two short hind legs. If you hurt his feelings, he draws back his head within his house. Let us tempt him with a nice juicy bit of lettuce. There, his slow, dull little eyes see it; he takes a bite and the piece is gone; but he may not eat again for weeks, and he goes to sleep all the winter in as cozy a corner as he can find. When he does move about he goes very slowly indeed, and many a more tiny creature could easily race him. He has a cousin who lives in a river, and another who basks on the seacoast and who may one day be made into soup for dinner. When he himself dies his bony armor will be made into little boxes, and combs, and purses. What do we call him?

THE MOST AWKWARD ANIMAL ON EARTH

3. In the forests of Africa is an animal which in the course of ages has changed to suit its home. It liked to eat the leaves on the tall acacia, so it grew a long neck to reach them. Thorns of prickly plants, the leaves of which it wanted, pierced its lip, so it grew a hard skin to keep it from pricks. To protect its nose from thorns and sand blown by the wind, it learned to close its nostrils tightly. To get away from animals that attacked it, rather than fight, it lengthened its legs, so that it could outrun other animals. It is usually gentle, but sometimes gets angry and bellows. Its coat is covered with large spots. Each of the four feet has two toes, and the strong hoofs are used in fighting. Being so tall, it finds drinking very awkward, and has to straddle its legs almost like the legs of a camera. How should we like to stoop nineteen feet to drink out of a pond? Fortunately it rarely gets thirsty. What is the name of the animal?

THE JELLY THAT WRAPS ITSELF ROUND THE FOOD IT EATS

4. Living in a drop of water is a curious little creature so simple that it is a mere speck of jelly. It has no real limbs, but it puts out "false feet" whenever it likes, and these it wraps round its food—a tiny living plant—without troubling at all about having no mouth. Its jelly-like mass thickens round the outside to form a kind of protecting wall. One peculiar thing this little creature can do is to divide itself into two new ones, each with a little dark part near its centre called the nucleus. So now it need not play about alone, for the two can float away in the water and seek their own adventures. Some of their relatives are dangerous and cause disease, another is kind and kills these when they get into our blood. What is its name?

A BIRD THAT IS NO BIRD, OR A BEAST THAT FLIES WITH ITS HANDS

5. To fly with hands! That is what we do in dreams, but there is a curious little animal that really uses its hands as wings, for it has made by the aid of its limbs a kind of parachute with which to fly. It suspends itself from the branch of a tree by hooks at the ends of its thumbs when it wants a rest or decides to go to sleep during the winter. It likes to flit about in the twilight, and seems as though it would dash its little body against trees and houses. But no, it swerves aside, for though it has small eyes, it has large ears and a delicate sense of touch, so that it knows when danger lies ahead. It is very quick indeed in its movements in the air. It does good in our country by eating insects that are harmful. It is the only mammal that can fly like a bird. Can we tell its name? Sometimes girls and women are afraid of it but without real reason.

THE ROMPING SCHOOL ON THE SURFACE OF THE SEA

6. Out at sea big dark creatures suddenly appear on the surface of the water. See, there is one. And now there are three more, tumbling about and rolling over and over. Look at the white on their under-sides. Now there is a baby one, and the whole family joins in a fine romp. A moment more, and they are all under water, diving for mackerel or herrings. They do not swim close in shore, but if we could see one near, we should find it has a very small ear, one nostril on the top of the head, and many sharp teeth in its jaws. On its back fin are little horny lumps, which remind us of the armor its ancestors used to wear. Its body contains much oil. We may have seen these creatures from a steamer round our American coast. What are they called?

ANSWERS TO THE GAME OF "WHY IS IT?"

On page 2742 some curious things were told us and we had to guess the reason underlying them. Here are the right answers.

1. The space allows for the rails to expand when heated by the summer sun.

2. The friend's image is reflected from the glass at the same angle as that of the little girl in the corner looking into the glass.

3. Rays of light from the steps and the shell did not reach our eyes in a straight line, but bent down toward our eyes on passing from the water into the air. So the shell and the sand appeared higher than they were.

4. A three-sided lustre in the glass chandelier acted as a prism and broke up the sunlight into the bars of color.

5. The call echoed from the rock on the opposite side of the valley at an angle the mother knew would just reach her son.

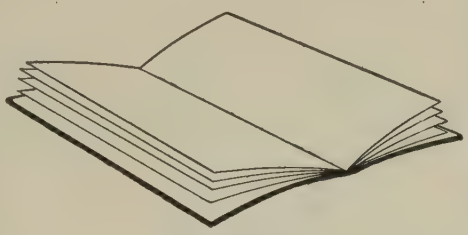
6. The corner of the handkerchief acted as a siphon, and the scent passed up along the threads in the material and down into the rest of the handkerchief.

7. The boy had fixed an Æolian harp in one of the attic windows. This was made of gut strings tuned over a shallow sounding-box. The wind made the strings vibrate and give out the musical sounds.

HOW TO MAKE A SIMPLE BOOK

HERE is a simple book which can be made so that it will compare favorably with one you might buy. It is known as a book of a single section, or signature, because it is more simply made than a book which is made up of many signatures. It may be used for mounting pictures or for any important notes or records which you may desire to keep.

The size of this book might well be determined by the purpose for which it is to be made, so first decide upon the particular use which is to be made of your book. The cover boards for this simple book should be made ⅛ inch wider and ¼ inch longer than the page, in order that the covers may project beyond the pages. Be sure to choose a rectangular piece of cardboard or so-called strawboard which is large enough to make one cover board. Next place this on a flat board or table and locate the ruler on the strawboard along the upper edge. After measuring 6⅝ inches from the left corner of the strawboard and making a mark, place the ruler just below the lower edge and make a mark on this edge 6⅝ inches from the left edge. Now draw a line connecting the mark just made with the one on the upper edge. After placing the ruler on the left edge of the strawboard and measuring down on the left edge 8½ inches from the upper corner, make a mark. Then be certain to measure down on the pencil line 8½ inches from upper edge and make another mark. Connect this mark with that on the left edge of the strawboard. You are now ready to cut out one cover board. Next lay out and cut a second cover board in the same manner.



A simple book.

In laying out the linen back you should measure off on the back of a piece of bookbinder's linen exactly 5 inches by 9½ inches, just as you measured out the strawboard, first from the left edge and then from the upper edge. Next, follow this by drawing a centre line lengthwise on this material. Now draw lines across either end parallel with the short edges of the material and ½ inch from them. You are then ready to paste the linen back to the cover boards, leaving ⅜ inch between the boards. The thickness of the book will determine this measurement. Of course you should protect your work by having at hand a pile of torn wrapping-papers or newspapers, each about 9 inches by 12 inches, during this pasting. These papers can be stacked before you so that you may keep your work upon the uppermost piece, which is always clean, since you will crumple the papers and throw them away as soon as they become soiled with the paste or glue. You will also use these papers under your hands when you are rubbing one pasted paper upon another.

In preparing the cover papers 5⅝ inches by 9½ inches, you should measure as suggested above. Follow this by pasting the cover paper to the cover boards and by cutting the corners off on a mitre and then pasting down the laps. Then count out half as many papers as the number of leaves desired in the book or six papers. There should be paper stock for this purpose cut 8½ inches by 13½ inches. Next measure and cut this paper into pieces 8¼ inches by 13 inches. Now fold each sheet to make two pages 6½ by 8¼ inches.

A piece of ordinary linen cloth is now needed to hold the covers to the leaves of the book. It is measured and cut ½ inch shorter than the length of the papers, or 7¾ inches long and 4 inches wide. A centre line is drawn lengthwise on this material. Then the pages are placed together and stabbed or pierced for sewing. This may be accomplished by means of a coarse needle or any sharp-pointed tool.

The linen is carefully placed outside the folded pages, its centre line lying along the stabbed holes. Next, the pages and linen are sewed together. This is done by having the needle first enter the centre hole, and then proceed in and out to one end of the row of stabbed holes before going back to the opposite end. Continue this on to the centre, where the knot is tied. Of course there should be an odd number of holes, which means either 3 or 5.

Next, fasten the signature, or section, of

pages to the cover boards by pasting the linen to the cover boards. Be careful to centre the signature at the back, so that it will be correctly placed in the cover boards. Finally, paste down the end sheets or leaves next to the covers. The drawing above shows this simple book, just before the end leaves have been pasted.

A USEFUL SHOE-BAG OF SERGE

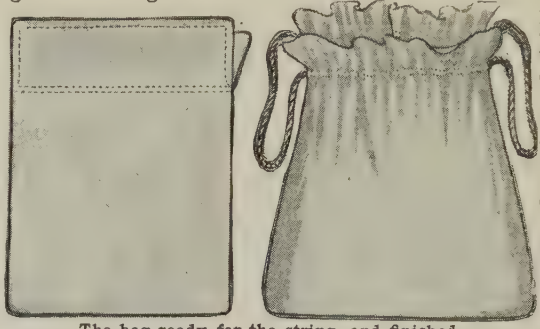
WHEN we go out to tea at a friend's house, or to a dancing class, we often want a bag for carrying our slippers. It looks better than a parcel, and the shoes are popped into it in a moment.

If we make our own bag, we can shape it as we please, and cut it large or small according to the size of the shoes we wear. One made in the style of a Dorothy bag with a drawing string looks well; while it can be made for quite a small sum, and is light and convenient to carry on the arm. If made of rather thick material, the bag will keep out the damp and rain.

The materials required are these: a piece of fairly thick material measuring about 30 inches by 13 inches, such as green art serge; the same quantity of sateen for the lining; 1 yard of twisted silk crêpe cord at a few cents a yard. Silk crêpe cord is the name given to it, though there is no resemblance to crêpe material.

If we choose the green art serge for the material, the sateen lining might be of a golden brown color, and the cord to match.

We must remember that slippers are going into the bag; therefore a light, dainty color, such as cream, would not be serviceable for a lining and we should choose a darker one.



The bag ready for the string, and finished.

Having cut out the serge and the sateen, we fold the serge over in halves lengthwise, wrong side out, join the sides together from the folds to about three-quarters or more up the sides by a stitched seam of rather small stitches, leaving enough margin to prevent fraying, using, if possible, cotton to match our material.

Then we fold the sateen for the lining in the same way, but instead of making stitched seams up the sides we turn in the rough edges of the sateen, and placing one over the other, sew them over and over with close, neat stitches, taking care not to pucker the sateen. The passing of a hot iron over these seams will make them lie flat.

Now we have roughly made two bags, one of the serge, the other of the sateen. Let us turn the sateen bag inside out and then push the serge bag into it, taking care to fit it into the corners neatly, till the lining lies smoothly against the serge. It will be necessary to stitch the lining to the material at the bottom corners to prevent its being dragged out when the shoes are withdrawn from the bag; but we should not let the stitches show through the material.

The bag now has the lining outside and the material inside. The next thing to be done is to finish the top of the bag. First we turn in the rough edges of the serge and the sateen from the point where we stopped joining up the sides of the bag, and hem the sateen down on the serge, a little way from the edge of the flaps, so that the lining does not show when the bag is held upright.

Now the bag is ready for the drawing string. There are two ways of running this into the neck of the bag. We may buy half a dozen small bone rings, and sew them at intervals along a line two or three inches from the edge of the flaps; then pass the string through these, and sew the two ends of it together. The other way is to make two running seams half an inch apart, three inches from the edge of the flaps through the serge and the sateen, and thread a string through and fasten the two ends together, and then run another string in and fasten its ends in the same way. By pulling a string from each side we shall see that our shoe-bag will close up quite neatly.

We now turn the bag right side out and it is finished, as in the second picture.

We have made, of course, quite a plain shoe-bag in which the shoes can be carried placed toe to heel and upright, so that they do not get in the way when carried in the bag, as they might do if placed flat along the bottom of it.

Many girls like to embroider their own initials on the bag. This can be done in satin stitch. The monogram is worked on the serge before the bag is made up.

A novel material for a very small shoe-bag, and one that costs nothing, is the silk of a man's old silk hat. The fact that the surface has been rubbed up does not matter, for it looks like fine plush, and after sponging and heating makes up excellently, and wears well, and is quite light for a little girl's hands. A scarlet sateen lining gives a charming effect.

These little Dorothy bags are useful for all kinds of things. If they are made of soft satin, in some dainty shade, they may be used for a workbag. We can also make them much smaller, of cretonne, and fit them up with needles, cottons, scissors and thimble and use them instead of a work-basket. It is quite easy to sew little loops of narrow elastic inside the bag to hold the fittings. They are very handy to tuck away in a corner of our trunk when we are going for a holiday.

THE NEXT THINGS TO MAKE AND TO DO ARE ON PAGE 3017.

MORE WORTHWHILE GAMES

CONTINUED FROM 2755

MORE SOUND GAMES
PROGRESSIVE PARTIES—COUNTING

WHEN you are reading in your story books you can tell what some of the new words are, can't you? Parts of them look like other words you know, so you think they must sound alike.

Look at these words

her am eat can him sit he bad cut

Which of them begin with the same sound as ?

Which of them end with the same sound as ?

Which of them have the same middle sound as ?

When you can tell how a word sounds just by looking at it, you will be able to find out many of the new words in your story

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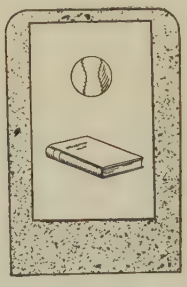
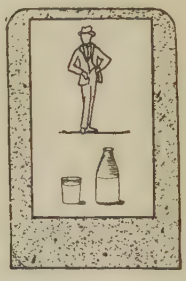
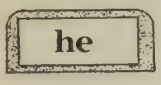
books. We will make up some practice cards with the words you will use the most in your reading. You will find them on pages 124, 125, 126 and 127 of your Work Book. Put each word on a plain card. Put each picture on a colored card. Use a blue one so you can remember these are the new and harder sound games. On the back of every one of the picture cards put the name of the letter sound.

There will be four of these blue sets just as there were four of the pink sets. If you don't win in playing with the blue set, you

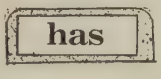




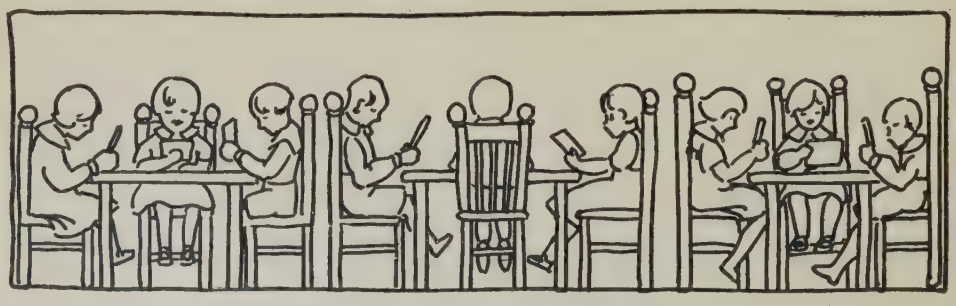
can practice with the easier pink games, and then with the blue set.



You can use these cards in all the ways you used the pink sets. For practice perhaps the best way is to lay the picture cards out in a row and match the word cards to them.



Of course the Stop game is the liveliest but you need to practice a good deal before you try to play a speed game, for you can't win in a speed game until you know the sounds and the words very well. When you can play Stop with these cards you can have a very jolly time in a progressive party.



DOES mother ever have progressive game parties at home? You know in a progressive game party you have several games going on at the same time at different tables. Perhaps everybody is playing the same kind of game, and perhaps not. One table is called the head table because the people at that table say when to begin and when to stop a game. Whenever they finish a game at their table they ring a bell and everybody stops playing and counts up score. The people who win move up to the next higher table and everybody starts to play again. When you get to the head table you stay as long as you can win there, but when you don't win you go to the end table and move up again.

Don't you think this kind of party would be great fun? Really it is. If you can get enough people to play with you, try it. You will probably want about three people at each table to make a good lively game of Stop. And you can have as many tables as you can get people for.

At a real progressive party there is usually a card on each table to tell its number, Table 1 or Table 2 or whatever it is. Then when your friends come, you can give each a card with his name and the number of the table where he is to begin playing. Or you can have the number cards in a pile or sticking out of a book or inside a box or bowl and let each friend draw a card to tell him at which table to begin playing. Any of these ways is fun. You might try different ways at different game parties, for I am sure you will want to have them often after you find out how much fun they are.

If you have invited eleven other people to play with you, you will need three cards to say Table 1, three to say Table 2 and so on. How many tables will you have? Yes, four tables if you have three children at each table. When everybody finds his table, the head table will ring the bell for them to begin playing. They will play their very best until the head table finishes a game and rings the bell. Then everybody stops and counts up score. The winners progress; that means they move on to another table. That is why we call this a progressive party, because you keep progressing as long as you win.

OF course you can have progressive parties with number games as well as with sound games. You might have the Addition Combinations for 1 2 3 4 5 at Table 1, those for 6 7 8 9 at Table 2, and the Subtraction Combinations for 1 2 3 4 5 at Table 3. If you do this way you will have to be careful at which table your friends play. You want each one to play at a table where he will win some of the turns and have a good time. So put each one at the table where you are sure he knows the combinations well enough to have a good time in a speed game. If you or mother know before they come, you can have cards all ready for them with their names and tables written on them.

When you can win at the head table in these games, you are ready to make yourself a harder number game with Subtraction Combinations. You can make a set for 6 7 8 9 just as you did the set for 1 2 3 4 5 . You will find the digits and the combinations on pages 128 and 129 of your Work Book.

YOU may get some pretty big scores in progressive parties. I wonder how far you can count them up, and write them. You can make a game for testing and practice with the numbers and the digits.

Count 1 2 3 4 5 6 and on to 25. Ask mother to help you. On the edge of the page are the numbers you counted. They begin at the bottom of the page and go up. If you look at them as you count, you will learn how they look and you will be able to write them.

Suppose your score in a game were eleven and you have forgotten how to write eleven. Count up to eleven and see how it looks. If your score is seventeen, count up to seventeen, look at seventeen and write it.

To be sure you know how many are eleven, or seventeen or twenty-five, count that many marbles or pennies or candies.

I wonder how far you know the numbers and the digits?

WHAT HAVE YOU LEARNED?

How many words from your dictionary can you read with?

How many of them can you write with?

How many words from your pink file can you read with?

How many of them can you write with?

Can you guess the word that answers puzzles about things you see every day?

Can you draw the answer so that other people know what the answer is?

Can you draw a simple story so that others can tell the story you were thinking about?

Can you tell about the story in a picture so well that someone can find the picture?

How many things can you draw so that other people can name them?

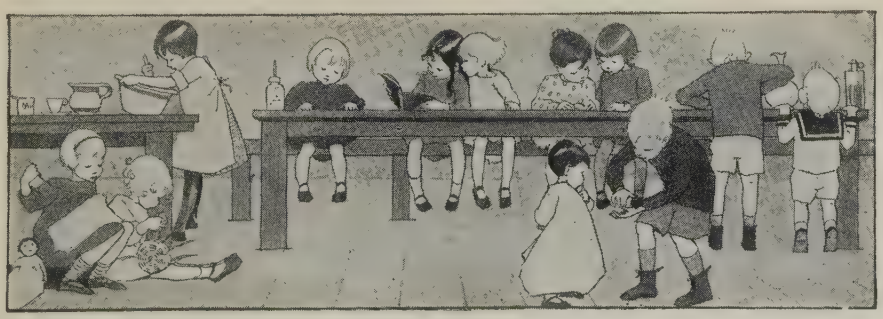
Can you draw them as well as the Very Good or the Good or the Fair drawings on pages 2752 to 2755?

How many sets of the blue sound games can you score Just Right? Which ones are they?

Can you play progressive games with the sound cards? With the number cards?

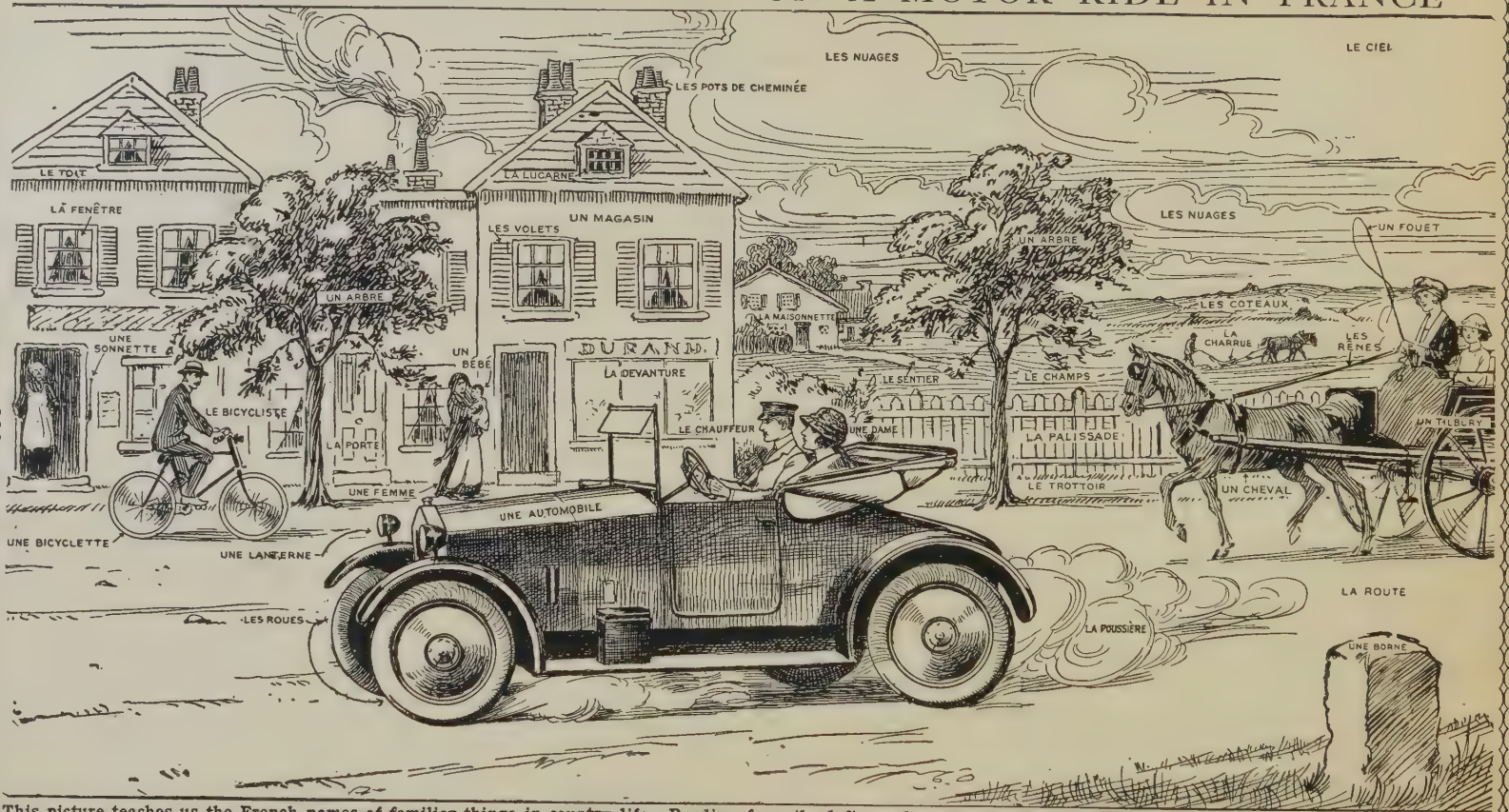
Can you score Just Right in the Subtraction Combinations for 6 7 8 9 ?

Can you read these numbers and do you know how many they are: 10 15 21 11 24 12 23 19 13 17 14 18 16 ?



THE NEXT HELPS TO LEARNING ARE ON PAGE 3121.

THE FAMILIAR THINGS WE SEE ON A MOTOR RIDE IN FRANCE



2888

This picture teaches us the French names of familiar things in country life. Reading from the left, we have the roof, window and bell of a little house, and a cyclist is passing on a bicycle. A shop with its chimney-pots and their smoke, its shutters, door, plate-glass window, and the owner's name, Durand—so familiar in France—is a background to a woman and her baby and an automobile with its chauffeur, lady, wheels, lantern and dust. To the right are the pathway, palings, tree and the foot-path. Then comes a horse pulling a gig, with reins and whip, along the road past a milestone. Beyond we see the plow in the field, and hills, clouds and sky above.

Young rooks leaving their nest for the first time.

THE CROW AND HIS FAMILY

CONTINUED FROM 2762

THE student of birds has a magnificent heritage. Spread before him is a Class of almost world-wide distribution, numbering upward of fifteen thousand species, to say nothing of the countless climatic varieties growing more numerous as time passes.

The greater number of the species are scientifically grouped into one huge assembly—the birds that perch. The most important of all the birds come into this group. They are birds of travel, birds which have brought to a fine art the difficult and often dangerous task of rearing naked nestlings to strength and efficiency.

In this Class are all the feathered singers, the creatures which first made melody in an unlovely world. Speed, power, daring, initiative, and the highest standard of bird brains are here, and with these fine attributes much that is lovely and gracious to the eye.

At the thought of beauty the mind naturally turns to visions of hummingbirds and birds of paradise, but discipline insists that we begin with crows. From a crow to a bird of paradise is but a stride.

We cannot call a crow a bird of paradise, but a bird of paradise is only a glorified crow. These black-coated gentry, the crows and ravens and jackdaws, have the most illustrious kindred at the high court of birds. The daw of the old fable was laughed to scorn for dressing himself in the fine feathers of an admired rival. He might very well have retorted that he came of a house in which there were gaudier trappings than any that he could assume.

The Crow Family is, indeed, at the head of all the winged creatures. They are highest in mental development, the philosophers of the tribe; and foremost in their ranks science places the sagacious Raven. It ought to be unnecessary to describe this bird to young readers; the raven should preside in gloomy majesty over every cliff in our land, or have its habitation in every wild, dark wood.

But ravens with us are little more common than the golden eagle. Established with peculiar esteem in all literature from ancient days to modern, the raven is at once hated and loved, feared and admired. It is the largest of all its family, twenty-five inches or more from the tip of the beak to the tip of the tail, entirely black save for purple reflections, and as lordly in its flight as a vulture.

The raven is found in many lands. In the icy North it eludes the paw of the polar bear as it makes a meal of a

dead seal or a dead shark; in South America it plays jackal to the jaguar; in Scotland and England it eats fruit, insects, frogs, mice, worms and grubs. It has almost disappeared from Eastern North America, but is still common in the West.

A weakly lamb or a stricken rabbit has reason to know the meaning of a raven's approach; and where a wounded animal escapes the hunters and dies in its tracks, the sable bird follows, to make meals of what would otherwise prove an offense.

WHY THE RAVEN HAS BEEN ALMOST EXTERMINATED

There is something terrible and revolting in these habits of the raven, but many other birds exist by eating living things. Must not a tomtit seem a dragon to a shrinking caterpillar?

It is not because he plays the merciful executioner to animals otherwise condemned to miserable, lingering death, that the raven has been persecuted almost out of existence in Great Britain. No; it is because he likes an egg and because he likes a plump bird. From that egg or bird might come something for so-called sportsmen to shoot. So down goes the raven.

There may have been a second cause for the ill-usage of the splendid bird. The gravity of its manner and costume have caused it to be associated in all lands with misfortune, illness and death; it has been regarded as the prophet of woe.

This common association of raven and unhappy events may have played its part in making it unpopular. Reasonable men would as cordially cherish it as Dickens cherished his comical ravens. They stole the children's pennies, saucily pecked their little naked calves, then ate white paint and died lamented deaths.

THE SOCIAL HABITS OF TWO COMMON CROWS

The bird which gives the type name to our group is, of course, the crow. In various lands there are many species. The Carrion Crow of Great Britain and the American Crow are almost exactly alike. In Europe there is also the Hooded Crow.

There is no mistaking the hooded crow, for, while his head, throat, wings and tail are black, the rest of his plumage is an ashy gray. On the other hand, the carrion crow and the common American crow are entirely black, except for a greenish violet sheen seen here and there. But nature seems to make less distinction between the two species than our eye does, for carrion crow will mate with hooded crow, and the young will take either variety for partner.

On the other hand, there is a difference in haunts. The black species prefers isolated nests in tree-tops, whereas the gray is as much at home on the scarred face of some frowning cliff as nesting in a tree. The habits of both are similar. They will eat foul flesh, they will eat live birds and steal eggs. The American crow pulls up the farmer's corn. Both harry other birds, both gobble up young pheasants and partridges; but one has known tame ducks to do the same thing.

Crows are wise, cautious and self-reliant. It must have been an advantage for the crow to nest in solitude when land was less cultivated than it is now and when houses were fewer. Nowadays the solitary nest of a pair of these birds in a tree is fatal to their safety, but the crows cling to their old habits.

This is curious, for when nesting cares are done, crows go off and mingle with rooks and jackdaws in perfect amity, and there, in the ruck of teeming black-coated favorites, escape detection.

THE LIFE OF THE ROOK COLONIES IN THE TREE-TOPS

The Rook is a European bird about the size of a crow. The rook's plumage exactly resembles that of the carrion crow till maturity is reached. Then, whereas the crow has the lower part of the beak covered with bristly feathers, the grown-up rook sheds these, becomes bare about the base of the bill, and is marked there by a white scurf-like patch.

In olden days the rook was regarded by the law as an enemy to mankind, and regulations for its suppression were made. Yet, thanks to its habit of forming great colonies and of working in harmonious co-operation with its fellows, the rook survives in greater numbers than any other large English bird.

A rookery in the tree-tops is one of the glories of English village life. What is more, the audacious birds have spread their colonies into the towns. They teem in parts of London, even in the heart of the city, where in the lovely old sanctuary gardens of the Inns of Court they are among the delights of daily life.

There was a great stampede of the rooks from Gray's Inn not many years ago when two carrion crows appeared and began to lunch and dine on baby rooks. The rooks vanished as if a plague had swept their nests, and for two years the solitude of their habitations was broken only by the harsh calls of the victors.

Then a man who loved the rooks put out poisoned meat. The two marauders ate it and died. Within a few days a sentinel rook came to spy out the land. It came from where no man knew; it departed to where no man saw. But it came back, bringing joyous companions with it. The old gardens rang again with such joyous cawings and squawkings as they had not known for many a month.

That is an evidence of the sagacity of these birds and of the great range of their travels. Some unwonted rush of cowardice frightened them into surrendering their entire colony to a couple of dreaded enemies. This was an unusual thing, as they will combine, as a rule, to mob and destroy winged assailants; but a scout flew over, discovered that the old home was safe again, and back they came rejoicing.

THE LONG PROCESSION OF ROOKS ACROSS THE EVENING SKY

On their daily travels for food rooks fly forty miles and more. The sight of their immense cohorts winging their homeward way in the evening is one to rejoice an Englishman's heart. They seem to fill miles of sky, as for nearly half an hour a long stream swims on lazy wings beneath the clouds in the wake of a leader. They appear as perfectly disciplined as flights of migrating birds racing back to us, in well-ordered array, from tropic lands.

We do not understand how birds manage these displays of government, nor do we understand what happens when these shiny rooks hold their great assemblies, which are sometimes called bird parliaments. They seem to debate, to ask questions, to get answers. Is it all meaningless? the play of automatic instinct? No man knows, but we all suspect that there is purpose in these quaint and fascinating gatherings.

We find freak varieties of the crow in Africa—the Thick-beaked Raven with a white patch at the back of the head and a beak suggesting a tendency to hornbill development; and there is the notable White-bellied Crow, which the inexpert must often mistake for a short-tailed, heavy-headed magpie. But the African Rook is as black as the Ethiopian himself. He makes a slight change in the Far East, for in Siberia the sheen on his feathers is slightly different in hue from that of the European bird, and the feathers round the beak in this species are retained throughout life. So the Siberian Rook is especially difficult to distinguish from the typical crow.

THE PLAYFUL HABITS OF THE WISE-LOOKING JACKDAW

The Jackdaw is also a European bird, four or five inches less in length than the crow and rook. The back of his wise little head is a sober gray, but the body is otherwise sooty. The jackdaw is easily identified in the company of the rooks with which he commonly flocks. No bird could be quite as wise as a jackdaw looks; no bird could be happier than the daw seems when his nesting cares are ended for the season and he romps and tumbles in the air with the delight of a puppy on the ground.

He plays on the wing as eagerly as a darting swallow, yet, because he builds in church towers and the turrets of stately castles, he has a reputation for gravity which doubtless earned him the confidence of the good monks of Rheims, where he naughtily stole the lord cardinal's ring.

THE MIMICRY OF THE JACKDAW WHEN KEPT IN CAPTIVITY

The jackdaw is shy of man but of nothing else. He is quite at home in a tree or in a rabbit's run or a cleft in a cliff. He eats anything that his tough crop can contain. Up where the seawinds sing he robs the guillemots of the fish they bring as unblushingly as a frigate bird chasing a gannet.

The so-called talk of the jackdaw is merely an imitation in captivity of sounds often heard. Of course, human speech is not mimicked by the bird when the daw is at liberty. We might think that the curious warbling of the Nutcracker, heard from the domesticated bird, comes only in captivity as well. But the nutcracker is shy, and utters its low warble only when all is still and silent. Therefore it is difficult to know what songs it sings at its ease in the wilds.

For the most part, all we hear is a shrieking rattle, and that too seldom, for

nutcrackers come but as infrequent stragglers into the towns. They are common enough in Northern Europe and Asia, and in Western North America. The Americans are grayish, with white-tipped feathers to the wings, and all the tail feathers white, save the middle pair, which are black. The Old World nutcrackers, however, are more of a chocolate brown, speckled with white, with bold black-and-white tail. All the species eat nuts and fruit, cracking nuts as dexterously as a thrush cracks his snail upon a favorite stone.

THE HANDSOME MAGPIES AND THEIR BEAUTIFUL COUSINS

More people are familiar with the Magpie, with his elegance and impudence, his handsome plumage of white and velvety sheeny black, and long flirting tail, which is rudder, balance and ornament all in one.

A comic talkative beauty in captivity, he is liveliness and excitability itself at large. Like a cock in a poultry yard, he takes upon himself the care of all the birds around by sounding wild alarms when cat or dog or some other enemy invades the scene. Though he is a thief of eggs and young birds, he repays us by enormous labor in the destruction of insects and field-mice. No wild bird better earns his keep than the handsome magpie.

Yes, he is handsome to us, but more so are some of his relatives—the radiant, Azure-winged Magpie of Spain and Portugal; the Blue-feathered and Red-beaked and Yellow-beaked magpies of Asia; and some other species in India which mingle chestnut and black in their plumage and, rare habit, eat bats!

THE RICH COLOR-SCHEMES OF THE GORGEOUSLY DRESSED JAYS

Asia may have her magpie wonders, but we turn again to match them with our magnificent Jay, a creature seemingly built of springs, all jerks and jumps, and short, dashing, flickering flight; nervous, cunning, shrewd as a rat, alert as a winged weasel; with a voice that chatters like a monkey, then, in alarm or anger, screams with the harshness of a piece of buckram being torn in half.

Yet what a beauty he is! He and the kingfisher are unbelievably lovely in the solitudes. The jay is a masterpiece of coloring. On the head is a crest which can be raised or depressed. The feathers are variously colored, grays and blues predominating, with here and there areas of black and white.

For all his bright color-scheme, the jay is often hard to see in the woods. He blends with the shadow and the color of the tree-trunks. Only when he flashes across some glade or walk which the sun lights up do you see his glories. A wood may teem with jays, but such are the stealth and cunning of the birds that a stranger might pass a hundred times without suspecting their presence.

Jays are a delight to all of us who love wild life, so not a word against the jay. He is a priceless ally against slugs and insect enemies of field and garden alike. Jays are found in many countries. There are remarkable examples in Siberia, which have a fine fluffy plumage to enable them to keep out the cold of that land's dreadful winter. There are jays in America in which a lovely blue is the predominant tone; jays in Brazil which are a harmonious riot of purple, blue and creamy yellow; and a Mexican example which combines green, black, blue and yellow. All the jays fly heavily, uncertainly, for short distances, but when moved by the migratory instinct, they take the air with magnificent courage and cover great distances with the stamina and directness of a hawk.

THE TRAGEDY OF A DWELLER ON THE RUGGED CLIFFS OF ENGLAND

Another European bird, the Chough, might have benefited had it also ventured on the bolder hazard of far migration. We can only say "perhaps," for the price of adventure to birds is high and the rate unfixed. These splendid creatures are rook-like in general outline, but with the long curved beak and the symmetrical feet and legs of coral-red.

For years it has been an unending regret to British lovers of birds that the choughs have been numbered with the vanishing ones. Why it should be so is hard to explain, except on the ground that they live in restricted stretches on the fringe of the land whence there is no escape, and so are easy prey to the merciless fowler and the mean thief of eggs.

As they come inland at times to forage, evidently they could add to their normal diet the items which charm the gull from the shore; but, in general, their fruit lies between high tide and low tide, harvested from the careless bounty of the sea. Fine,

THE GORGEOUS BIRDS OF PARADISE

The Golden-crested Bird of Paradise.

The Six-plumed Bird of Paradise.

Red Birds of Paradise.

merry birds, handsome and graceful, they are on the decrease; and to say, as enemies of all preying birds do, that falcons are the prime murderers in the tragedy is to divert attention from the real culprit, and that is man.

Fortunately some of their relatives have secured sanctuaries among the silent mountain fastnesses of Europe. They are Red-billed and Yellow-billed, but all speak the same language as the British species —the *chough-chough,* with which these birds, like the European cuckoo with his call, proclaim their pleasant name.

The curved beak of the chough leads us on, with other parallel features, to another of the crow's kindred, the Huia of New Zealand, a bird which keeps shyly to still heights and to mountain valleys as silent in the beautiful island dominion at the other side of the world.

The huia feeds chiefly on grubs which infest wood, and obtains them by pecking at decaying timbers as the woodpecker does. But whereas the male has a short stout beak, the female has a long slender curved bill. He can extract the grubs rendered accessible by a few blows at surface decay, but she can draw food from a bough whose depth is too great for him.

Like a cockerel in a poultry yard, he will call her to food which he has found; but when she makes her haul of a grub beyond his power of penetration, she, not he, eats it. She does not divide the spoil which she has discovered. The differing equipment of the two birds gives her an advantage which he does not possess, and the result must be beneficial to the race of huias.

THE GAY BIRDS OF PARADISE, KINGS OF THE CROW TRIBE

We come at last to the kings of the crow tribe, the birds of paradise themselves. Of course no crow could ever become a bird of paradise, and no bird of paradise could shed its lustrous garb and become a sombre raven. But there is not a doubt that all these birds arose from one and the same family.

The birds of paradise are confined to New Guinea, the Papuan Islands, to a part of Northern Australia, and, as to one species, the Molucca Islands. They have flowered into beauty and loveliness like nothing else in animate creation. Nature seems to have lavished half the miracles of her palette and of her deftness in pattern-weaving on this single group of birds. Some fifty species have been developed. The simplest is a marvel of hue and outline and arrangement of feathers, and the most ornate is strangely beautiful beyond the art of words to describe.

In most birds feathers serve as cover or for flight, no matter how decorative. Here we have feathers which are different from all others—feathers which are like living wires for the greater part of their distance. Then they are tipped with a web like the glowing circle of a peacock's tail feathers.

The Twelve-wired Bird of Paradise, a blended medley of rich colors, has six pairs of these wire-like growths. They reach from the breast, then sweep forward in a bold curve to set off a velvety scheme of yellow, black, purple, bronze and metallic green and violet. The Rifle birds lack the wires, but are clad in gorgeous metallic plumes which form shields about the head and throat; the Scale-breasted species have a combination of scale-like feathers harmonizing with plumes soft and fine as velvety hair.

HOW THE BIRD OF PARADISE RECEIVED ITS NAME

But we must pass to the Great Bird of Paradise, the type of all the paradise birds. It was so named because, when Linnæus first saw a skin of one of the birds, he thought Paradise itself must be peopled with living loveliness like this.

This bird is a sheer wonder. From fifteen to eighteen inches long, the bird's body is clad in brown of rich hue, shading into violet and purple. The head is crowned with gold and crossed with rich metallic green. The tone lightens into emerald as the feathers reach the throat. A pale blue beak contrasts with pale pink feet and legs. But that is only the smaller part of the work at which nature has labored.

From the body extend superb plumes of vivid orange merging into brown, while from the tail rise two extraordinary wire-like feathers thirty inches long. The ornamental tufts of feathers springing from the body can be raised and lowered. When the bird is displaying itself it seems to be the centre of a shower of gleaming gold, a cascade of liquid metal.

The Red Bird of Paradise gets its title from the intense red with which the sides of its body are clad, rigid feathers with

MEMBERS OF THE GREAT CROW FAMILY

A White-necked Crow.

The male Huia bird.

The Jay guards its nest.

The Raven feeds its large and clamorous family of young ones.

Great-billed Ravens.

A Bower Bird in its bower.

Pictures, Sir H. H. Johnston, Messrs. W. S. Berridge, A. Brook, H. François, and others.

the tips horny and nearly white. About the head the feathers seem greeny lustrous velvet, the neck gold and orange, the hind part of the back yellow, the wings golden shading into chestnut, the breast a metallic purple; and from the tail spring two long shafts destitute of webbing.

The King Bird of Paradise has fan-like plumes on the breast and a racket-shaped tail. Wilson's Bird of Paradise is stranger still. The back and wings are scarlet, and over them riots a coverlet of feathers of palest gold, with metallic green, spotted with glistening violet on the breast, with two of the tail feathers continued into fantastic but graceful spirals. But the most remarkable feature of all is that tracts of this bird's head are bare.

Another freak beauty is the Six-plumed Bird of Paradise, a creature rejoicing in the strangest head in the world. The body plumage is a sheeny black, but a vivid bar of green crosses the crown, a dazzling gorget of bronze adorns the throat, and from the handsome head spring six plumes, three on each side. They reach out from the rear of the skull, wire-like for the greater extent, but tipped with exquisite plumes at the end.

THE PRIDE OF THE BIRDS IN THEIR COATS OF MANY COLORS

There are many other wonders among the birds of paradise, and it is curious that all this rich and elaborate scheme of ornamentation seems planned solely to gratify nature's desire for splendor. The birds are as proud of their fineness as children of a new coat. They are consumed with activity and vanity. They flit here and there in the trees and in quiet sunny glades, displaying themselves and challenging each other to display of rival beauties. They dance, they flaunt, they skip and hop, and flirt their glories as if conscious of every note of charm in their incomparable make-up. And the end of it all is that the female heart may be charmed and the handsomest bird win the bride.

It is strange that in the same part of the world which has seen the rise of these supreme beauties we find related birds, not in themselves specially notable for loveliness, yet which have as eager a longing for beauty as the paradise birds. These artists are the Satin Bower Birds.

The name comes from the satin-like texture of the feathers, and from the unique habit of the birds in constructing bowers in the bush in which to assemble and play. There are several species in Australia and Papua, but the same instinct runs through all with variations.

They all make runs terminating in inclosures of vegetation, and these they decorate in various ways. Some content themselves with the display of bleached bones and pretty pebbles; some seek far and near for the bright-hued feathers shed from the bodies of parrots and other birds of brilliant tint. Others scour the neighborhood for anything of color to vary the sober tints of the scene in which the bower is constructed.

THE GAILY DECORATED BOWER OF AN ARTISTIC LITTLE HOST

But the artist and poet of the tribe seems to be the Prionodura, or Newton's Bower Bird, for this little specialist, having woven his bower, adorns it only with flowers—rich and lovely orchids—arranged with amazing art and cunning.

There is purpose in all this, we may be sure. Perhaps the best decorator wins the fairest bride. But the social instinct is there too. Bower birds entertain bower birds. Many birds assemble to leap and dance, curvet and skip in one hall or bower. The same meeting-place serves year after year. Day by day repairs are made, and at times there must be new decoration. Flowers are removed as they fade and new ones are brought; bones and stones are replaced by bones and stones of livelier hue or preferable shape; or the spoil may go on accumulating bird-riches, like a wealthy man's pictures or statues. Half a bushel of bones have been found in a single bower. The stones have been identified as those gathered from a distant river bank, all brought one at a time in the beak of the bird.

THE VARIED CHARACTERS OF THE MEMBERS OF THE CROW FAMILY

Wisdom, courage, inborn beauty, and effort to secure beauty from without, we see in this single group of birds. The heroes of the brigade are crows in essence, name them as we will, decorate and equip them as nature may. Perhaps we should speak with deference of a crow. Anyone would be proud to claim kindred with Shakespeare or with Shelley; what would be the vanity of Master Jackdaw if he knew that the great bird of paradise was his cousin?

THE NEXT STORY OF ANIMAL LIFE IS ON PAGE 2967.

BIRDS OF THE NORTHERN HEMISPHERE (I)

Here we begin a series of pictures of birds in their natural colors. Some of these are common; others are rare; and a few are not found in America, but are much like American species. If you will use the index, you can find something about nearly all of them. Other colored pictures of birds are to be found in the chapters on Birds of North America, and on pages 3129-32, 3281-84, 3621-24 and 4369-72.

1. Hawfinch. 2. Nightingale. 3. Starling. 4. European Redstart. 5. Swallow. 6. Turtle Dove.
7. Mute Swan. 8. White-tailed Sea Eagle. 9. Black-headed Gull. 10. Black Grouse. 11. Blue Tit.
12. Black Guillemot. 13. Northern Eider. 14. Coot.

1. Fork-tailed Petrel. 2. Dunlin. 3. Gray Lag Goose. 4. European Partridge. 5. Red-throated Loon. 6. Hedge Sparrow. 7. Garden Warbler. 8. European Sparrow Hawk. 9. Golden Plover. 10. Reed Bunting. 11. Mallard Duck. 12. Missel Thrush. 13. Dipper. 14. Wood Warbler. 15. Cormorant

1. European Siskin. 2. Peregrine Falcon, or Duck Hawk. 3. Heron. 4. Song Thrush. 5. Teal. 6. Rook. 7. Pheasant. 8. Blackcap. 9. Sedge Warbler. 10. Nightjar. 11. Cuckoo. 12. White Wagtail. 13. Snow Bunting. 14. Arctic Skua.

1. Tree Sparrow. 2. Whimbrel. 3. French Partridge. 4. Great Spotted Woodpecker 5. European Buzzard. 6. Barn Owl. 7. Chiff-chaff. 8. Jackdaw 9. Whinchat. 10. Meadow Pipit. 11. Bearded Reedling. 12. Puffin. 13. Twite. 14. Widgeon. 15. Lapwing. 16. European Wood Pigeon.

EVER evading God but seeking vainly elsewhere for sympathy and love, man is pictured here as pursued in all his wanderings by deliberate swift Feet, by an insistent Voice. At last, broken and defenseless, he is overtaken and finds that the love he has sought so long and so blindly is only to be found in Him so long denied. Francis Thompson, who wrote this magnificent poem, was born in 1859 and died in 1907.

THE HOUND OF HEAVEN

CONTINUED FROM 2772

I FLED Him, down the nights and down the days;
I fled Him, down the arches of the years;
I fled Him, down the labyrinthine ways
Of my own mind; and in the mist of tears
I hid from Him, and under running laughter.
Up vistaed hopes I sped;
And shot, precipitated
Adown Titanic glooms of chasmèd fears,
From those strong Feet that followed, followed after.
But with unhurrying chase,
And unperturbèd pace,
Deliberate speed, majestic instancy,
They beat—and a Voice beat
More instant than the Feet—
"All things betray thee, who betrayest Me."

. . . . . .

Across the margent of the world I fled,
And troubled the gold gateways of the stars,
Smiting for shelter on their clangèd bars;
Fretted to dulcet jars
And silvern chatter the pale ports o' the moon.
I said to dawn, Be sudden; to eve, Be soon;
With thy young skyey blossoms heap me over
From this tremendous Lover!
Float thy vague veil about me, lest He see!
I tempted all His servitors, but to find
My own betrayal in their constancy,
In faith to Him their fickleness to me,
Their traitorous trueness, and their loyal deceit.
To all swift things for swiftness did I sue;
Clung to the whistling mane of every wind.
But whether they swept, smoothly fleet,
The long savannahs of the blue;
Or whether, Thunder-driven,
They clanged his chariot 'thwart a heaven
Plashy with flying lightnings round the spurn o' their feet:—
Fear wist not to evade, as Love wist to pursue.
Still with unhurrying chase,
And unperturbèd pace,
Deliberate speed, majestic instancy,
Came on the following Feet,
And a Voice above their beat—
"Naught shelters thee, who wilt not shelter Me."

I sought no more that after which I strayed
In face of man or maid;
But still within the little children's eyes
Seems something, something that replies;
They at least are for me, surely for me!
I turned me to them very wistfully;
But, just as their young eyes grow sudden fair
With dawning answers there,
Their angel plucked them from me by the hair.
"Come, then, ye other children, Nature's—share
With me" (said I) "your delicate fellowship;
Let me greet you lip to lip,
Let me twine you with caresses,
Wantoning
With our Lady-Mother's vagrant tresses,
Banqueting
With her in her wind-walled palace,
Underneath her azure dais,
Quaffing, as your taintless way is,
From a chalice
Lucent-weeping out of the dayspring."
So it was done:
I in their delicate fellowship was one—
Drew the bolt of Nature's secrecies.

. . . . . .

But not by that, by that, was eased my human smart.
In vain my tears were wet on Heaven's gray cheek.
For ah! we know not what each other says,
These things and I; in sound *I* speak—

Their sound is but their stir, they speak by silences.
Nature, poor stepdame, cannot slake my drouth;
Let her, if she would owe me,
Drop yon blue bosom-veil of sky, and show me
The breasts of my tenderness:
Never did any milk of hers once bless
My thirsting mouth.
Nigh and dry draws the chase,
With unperturbèd pace,
Deliberate speed, majestic instancy;
And past those noisèd Feet
A voice comes yet more fleet—
"Lo! naught contents thee, who content'st not Me."

Naked I wait Thy love's uplifted stroke!
My harness piece by piece Thou hast hewn from me,
And smitten me to my knee;
I am defenseless utterly.
I slept, methinks, and woke,
And, slowly gazing, find me stripped in sleep.
In the rash lustihood of my young powers,
I stood the pillaring hours
And pulled my life upon me; grimed with smears
I stand amid the dust o' the mounded years—
My mangled youth lies dead beneath the heap.
My days have crackled and gone up in smoke,
Have puffed and burst as sun-starts on a stream.
Yea, faileth now each dream,
The dreamer, and the lute the lutanist;
Even the linked fantasies, in whose blossomy twist
I swung the earth a trinket at my wrist,
Are yielding; cords of all too weak account
For earth with heavy griefs so overplussed.
Ah! is Thy love indeed
A weed, albeit an amaranthine weed,
Suffering no flowers except its own to mount?
Ah! must—
Designer infinite!—
Ah! must Thou char the wood ere Thou canst limn with it?

My freshness spent its wavering shower i' the dust:
And now my heart is as a broken fount,
Wherein tear-drippings stagnate, spilt down ever
From the dank thoughts that shiver
Upon the sighful branches of my mind.
Such is; what is to be?
The pulp so bitter, how shall taste the rind?
I dimly guess what Time in mists confounds:
Yet ever and anon a trumpet sounds
From the hid battlements of Eternity;
Those shaken mists a space unsettle, then
Round the half-glimpsèd turrets slowly wash again.
But not ere him who summoneth
I first have seen, enwound
With glooming robes purpureal, cypress-crowned;
His name I know, and what his trumpet saith.

Whether man's heart or life it be which yields
Thee harvest, must Thy harvest fields
Be dunged with rotten death?
Now of that long pursuit
Comes on at hand the bruit;
That Voice is round me like a bursting sea:
"And is thy earth so marred,
Shattered in shard on shard?
Lo, all things fly thee, for thou flyest Me!
Strange, piteous, futile thing,
Wherefore should any set thee love apart?
Seeing none but I makes much of naught"
(He said),
"And human love needs human meriting:
How hast thou merited—
Of all man's clotted clay the dingiest clot?
Alack, thou knowest not
How little worthy of any love thou art!
Whom wilt thou find to love ignoble thee
Save Me, save only Me?
All which I took from thee, I did but take,
Not for thy harms,
But just that thou might'st seek it in My arms.
All which thy child's mistake
Fancies as lost, I have stored for thee at home:
Rise, clasp My hand, and come!"
Halts by me that footfall:
Is my gloom, after all,
Shade of His hand, outstretched caressingly?
"Ah, fondest, blindest, weakest,
I am He Whom thou seekest!
Thou dravest love from thee, who dravest Me."

A SECRET SONG*

Elizabeth Roberts Macdonald, the gifted sister of Charles G. D., Theodore Goodridge and William Carman Roberts, was a poet of renown and a nature-lover. In these verses she reveals the secret of one of the winter songsters that she knew so well in New Brunswick.

O SNOW-BIRD, Snow-bird!
Welcome thy note when maple boughs are bare.
Thy merry twitter, thy emphatic call,
Like silver trumpets pierce the freezing air
What time the crystal flakes begin to fall.
We know thy secret! When the day grows dim,
Far from the homes that thou hast cheered so long,
Thy chirping changes to a twilight hymn.
O Snow-bird, Snow-bird, wherefore hide thy song?

O Snow-bird, Snow-bird!
Is it a song of sorrow none may know,
An aching memory? Nay, too glad the note.
Untouched by knowledge of our human woe,
Clearly the crystal flutings fall and float.
We hear thy tender ecstasy, and cry:
"Lend us thy gladness that can brave the chill;
Under the splendours of the winter sky,
O Snow-bird, Snow-bird, carol to us still."

* By permission of Small, Maynard & Co.

IF WE HAD BUT A DAY

If We Had But a Day was written by Mary Lowe Dickinson. How many of us have ever thought before how we would spend the time if we had but one day to live?

WE should fill the hours with the sweetest things,
If we had but a day;
We should drink alone at the purest springs
In our upward way;
We should love with a lifetime's love in an hour
If the hours were few;
We should rest, not for dreams, but for fresher power
To be and to do.
We should waste no moments in weak regret
If the day were but one;
If what we remember and what we forget
Went out with the sun;
We should be from our clamorous selves set free
To work or to pray,
And to be what the Father would have us be,
If we had but one day.

SHE WALKS IN BEAUTY

Lord Byron gives us one of the most charming descriptions of a beautiful woman that has ever been written.

SHE walks in beauty like the night
Of cloudless climes and starry skies,
And all that's best of dark and bright
Meet in her aspect and her eyes;
Thus mellowed to that tender light
Which heaven to gaudy day denies.

One shade the more, one ray the less,
Had half impaired the nameless grace
Which waves in every raven tress
Or softly lightens o'er her face,
Where thoughts serenely sweet express
How pure, how dear their dwelling-place.

And on that cheek, and o'er that brow
So soft, so calm, yet eloquent,
The smiles that win, the tints that glow,
But tell of days in goodness spent—
A mind at peace with all below,
A heart whose love is innocent!

SHE WAS A PHANTOM OF DELIGHT

Contrast these lines by William Wordsworth with those by Lord Byron. Both treat of the same subject and yet note how differently each poet approaches his theme.

SHE was a phantom of delight
When first she gleamed upon my sight;
A lovely apparition, sent
To be a moment's ornament;
Her eyes as stars of twilight fair;
Like Twilight's, too, her dusky hair;
But all things else about her drawn
From May-time and the cheerful dawn;
A dancing shape, an image gay,
To haunt, to startle, and waylay.

I saw her upon nearer view,
A spirit, yet a woman, too!
Her household motions light and free,
And steps of virgin liberty;
A countenance in which did meet
Sweet records, promises as sweet;
A creature not too bright or good
For human nature's daily food,
For transient sorrows, simple wiles,
Praise, blame, love, kisses, tears, and smiles.

And now I see with eye serene
The very pulse of the machine;
A being breathing thoughtful breath,
A traveller between life and death;
The reason firm, the temperate will,
Endurance, foresight, strength, and skill;
A perfect woman, nobly planned
To warn, to comfort, and command;
And yet a Spirit still, and bright,
With something of an angel-light.

WILLIAM THE CONQUEROR

Charles Mackay illustrates that side of a warrior's life which historians often neglect. We know that with all his conquests William the Conqueror was not contented.

GREAT King William spread before him
All his stores of wealth untold—
Diamonds, emeralds, and rubies,
Heaps on heaps of minted gold.
Mournfully he gazed upon it
As it glittered in the sun,
Sighing to himself, "Oh, treasure,
Held in care, by sorrow won!
Millions think me rich and happy;
But, alas! before me piled,
I would give thee ten times over
For the slumbers of a child."

Great King William from his turret
Heard the martial trumpets blow;
Saw the crimson banners floating
Of a countless host below;
Saw their weapons flash in sunlight,
As the squadrons trod the sward;
And he sighed, "Oh, mighty army,
Hear thy miserable lord:
At my word thy legions gather,
At my nod thy captains bend;
But with all thy power and splendour,
I would give thee for a friend!"

Great King William stood on Windsor,
Looking from its castled height
O'er his widespread realm of England
Glittering in the morning light;
Looking on the tranquil river
And the forest waving free;
And he sighed: "Oh, land of beauty,
Fondled by the circling sea,
Mine thou art, but I would yield thee
And be happy could I gain,
In exchange, a peasant's garden,
And a conscience free from stain."

THE BUGLE

This beautiful poem written by Tennyson is taken from The Princess. The rhythm expresses perfectly the echoes.

THE splendour falls on castle walls
And snowy summits old in story;
The long light shakes across the lakes,
And the wild cataract leaps in glory.
Blow, bugle, blow, set the wild echoes flying,
Blow, bugle; answer, echoes, dying, dying,
dying.

O hark! O hear! how thin and clear,
And thinner, clearer, farther going!
O sweet and far, from cliff and scar
The horns of Elfland faintly blowing!
Blow, let us hear the purple glens replying:
Blow, bugle; answer, echoes, dying, dying,
dying.

O love, they die in yon rich sky,
They faint in hill or field or river;
Our echoes roll from soul to soul,
And grow for ever and for ever.
Blow, bugle, blow, set the wild echoes flying,
And answer, echoes, answer, dying, dying,
dying.

THE BLESSED DAMOZEL

Dante Gabriel Rossetti (1828–1882) was the son of an Italian refugee poet and liberal who, after settling in London, became a professor of Italian and a lecturer. His family, besides Dante Gabriel, consisted of another son and two daughters, one of whom was Christina the poet. As an artist Dante Gabriel Rossetti was one of the founders of what is called the Pre-Raphaelite school, which borrowed its inspiration from early Italian frescoes. This school had a great influence during the middle years of the reign of Queen Victoria. As a writer, Rossetti developed with equal pace, his goal to reach through art the forgotten world of old romance. The Germ (1850) contained his first published prose and verse. In it was The Blessed Damozel. In his poetry, as in his pictures, we feel the ever present consciousness of the spiritual world and of the struggle of the soul with earthly conditions.

THE blessed damozel leaned out
From the gold bar of Heaven;
Her eyes were deeper than the depth
Of waters stilled at even;
She had three lilies in her hand,
And the stars in her hair were seven.

Her robe, ungirt from clasp to hem,
No wrought flowers did adorn,
But a white rose of Mary's gift,
For service sweetly worn;
Her hair that lay along her back
Was yellow like ripe corn.

Herseemed she scarce had been a day
One of God's choristers;
The wonder was not yet quite gone
From that still look of hers;
Albeit, to them she left, her day
Had counted as ten years.

(To one, it is ten years of years.
. . . Yet now, and in this place,
Surely she leaned o'er me—her hair
Fell all about my face. . . .
Nothing: the autumn fall of leaves.
The whole year sets apace.)

It was the rampart of God's house
That she was standing on;
By God built over the sheer depth
The which is Space begun;
So high, that looking downward thence
She scarce could see the sun.

It lies in Heaven, across the flood
Of ether, as a bridge.
Beneath, the tides of day and night
With flame and darkness ridge
The void, as low as where this earth
Spins like a fretful midge.

Around her, lovers, newly met
'Mid deathless love's acclaims,
Spoke evermore among themselves
Their heart-remembered names;
And the souls mounting up to God
Went by her like thin flames.

And still she bowed herself and stooped
Out of the circling charm;
Until her bosom must have made
The bar she leaned on warm,
And the lilies lay as if asleep
Along her bended arm.

From the fixed place of Heaven she saw
Time like a pulse shake fierce
Through all the worlds. Her gaze still strove
Within the gulf to pierce
Its path; and now she spoke as when
The stars sang in their spheres.

The sun was gone now; the curled moon
Was like a little feather
Fluttering far down the gulf; and now
She spoke through the still weather.
Her voice was like the voice the stars
Had when they sang together.

(Ah sweet! Even now, in that bird's song,
Strove not her accents there,
Fain to be hearkened? When those bells
Possessed the mid-day air,
Strove not her steps to reach my side
Down all the echoing stair?)

"I wish that he were come to me,
For he will come," she said.
"Have not I prayed in Heaven?—on earth,
Lord, Lord, has he not prayed?
Are not two prayers a perfect strength?
And shall I feel afraid?

"When round his head the aureole clings,
And he is clothed in white,
I'll take his hand and go with him
To the deep wells of light;
As unto a stream we will step down,
And bathe there in God's sight.

"We two will stand beside that shrine,
Occult, withheld, untrod,
Whose lamps are stirred continually
With prayer sent up to God;
And see our old prayers, granted, melt
Each like a little cloud.

"We two will lie i' the shadow of
That living mystic tree
Within whose secret growth the Dove
Is sometimes felt to be,
While every leaf that His plumes touch
Saith His Name audibly.

"And I myself will teach to him,
I myself, lying so,
The songs I sing here; which his voice
Shall pause in, hushed and slow,
And find some knowledge at each pause,
Or some new thing to know."

(Alas! we two, we two, thou say'st!
Yea, one wast thou with me
That once of old. But shall God lift
To endless unity
The soul whose likeness with thy soul
Was but its love for thee?)

"We two," she said, "will seek the groves
Where the lady Mary is,
With her five handmaidens, whose names
Are five sweet symphonies,
Cecily, Gertrude, Magdalen,
Margaret and Rosalys.

"Circlewise sit they, with bound locks
And foreheads garlanded;
Into the fine cloth white like flame
Weaving the golden thread,
To fashion the birth-robes for them
Who are just born, being dead.

"He shall fear, haply, and be dumb:
Then will I lay my cheek
To his, and tell about our love,
Not once abashed or weak:
And the dear Mother will approve
My pride, and let me speak.

"Herself shall bring us, hand in hand,
To Him round whom all souls
Kneel, the clear-ranged unnumbered heads
Bowed with their aureoles:
And angels meeting us shall sing
To their citherns and citoles.

"There will I ask of Christ the Lord
Thus much for him and me:—
Only to live as once on earth
With Love, only to be,
As then awhile, for ever now
Together, I and he."

She gazed and listened and then said,
Less sad of speech than mild,—
"All this is when he comes." She ceased.
The light thrilled towards her, filled
With angels in strong level flight.
Her eyes prayed, and she smiled.

(I saw her smile.) But soon their path
Was vague in distant spheres:
And then she cast her arms along
The golden barriers,
And laid her face between her hands,
And wept. (I heard her tears.)

THE FAIRY TEMPTER

Samuel Lover, the Irish poet and novelist, is the author of this charming fairy poem. It is a beautiful fancy, with a lesson for all of us—not to be tempted from the path of duty, always plain if not always inviting.

A FAIR girl was sitting in the greenwood shade,
List'ning to the music the spring birds made;
When sweeter by far than the birds on the tree
A voice murmured near her: "Oh, come, love, with me—
In earth or air,
A thing so fair
I have not seen as thee!
Then come, love, with me.

"With a star for thy home, in a palace of light,
Thou wilt add a fresh grace to the beauty of night;
Or, if wealth be thy wish, thine are treasures untold,
I will show thee the birthplace of jewels and gold—
And pearly caves
Beneath the waves—
All these, all these are thine,
If thou wilt be mine."

Thus whispered a fairy to tempt the fair girl,
But vain was the promise of gold and of pearl;
For she said: "Tho' thy gifts to a poor girl were dear,
My father, my mother, my sisters are here—
Oh, what would be
Thy gifts to me
Of earth, and sea, and air,
If my heart were not there?"

THE MOTHER TO HER INFANT

There is real feeling in Thomas Miller's picture of the mother watching over her baby asleep in its cradle.

SLUMBER, my darling, no danger is near,
Thy mother sits by thee to guard thy repose;
Though the wind roars aloud, not a breath reaches here,
To shake the white curtains which round thee do close:
Then slumber, my darling, and sleep without fear,
Thou art safe from all danger, my dearest, while here.

What is it the angels do unto thee say,
When thou dost lie smiling so sweet in thy sleep?
Are they trying, my sweetest, to lure thee away,
And leave me alone in my sorrow to weep?
Oh, sometimes I fancy they whisper thy name,
And would fain bear thee back to the land whence they came.

Then never, my darling, when thou growest old,
Forget her who on thy sweet infancy smiled,
To whom thou wert dearer than jewels and gold,
Who studied thy looks and thy wishes, my child,
Who, when thou didst need her, was never away,
In health or in sickness, by night or by day.

THE SNOW-STORM

Ralph Waldo Emerson shows the north wind as architect one stormy night transforming familiar things with snow to strange fantastic shapes.

ANNOUNCED by all the trumpets of the sky,
Arrives the snow, and, driving o'er the fields,
Seems nowhere to alight: the whited air
Hides hills and woods, the river, and the heaven,
And veils the farm-house at the garden's end.
The sled and traveller stopped, the courier's feet
Delayed, all friends shut out, the house-mates sit
Around the radiant fireplace, enclosed
In a tumultuous privacy of storm.

Come see the north wind's masonry.
Out of an unseen quarry evermore
Furnished with tile, the fierce artificer
Curves his white bastions with projected roof
Round every windward stake, or tree, or door.
Speeding, the myriad-handed, his wild work
So fanciful, so savage, naught cares he
For number or proportion. Mockingly,
On coop or kennel he hangs Parian wreaths;
A swan-like form invests the hidden thorn;
Fills up the farmer's lane from wall to wall,
Maugre the farmer's sighs; and at the gate
A tapering turret overtops the work.
And when his hours are numbered, and the world
Is all his own, retiring as he were not,
Leaves, when the sun appears, astonished Art
To mimic in slow structures, stone by stone,
Built in an age, the mad wind's night-work,
The frolic architecture of the snow.

SOUND LOUD THE CLARION

These four lines of verse by the great Sir Walter Scott are frequently quoted and well worth committing to memory.

SOUND, sound the clarion, fill the fife!
To all the sensual world proclaim,
One crowded hour of glorious life
Is worth an age without a name.

YOUNG AND OLD

Charles Kingsley in these oft-quoted verses sets down a whole lifetime of experience. By the quick contrast of the gay days of youth and the gray days of later life he conveys a feeling no amount of prose-writing could express.

WHEN all the world is young, lad,
And all the trees are green;
And every goose a swan, lad,
And every lass a queen;
Then hey for boot and horse, lad,
And round the world away;
Young blood must have its course, lad,
And every dog his day.

When all the world is old, lad,
And all the trees are brown;
And all the sport is stale, lad,
And all the wheels run down;
Creep home, and take your place there,
The spent and maimed among;
God grant you find one face there
You loved when all was young.

LITTLE VERSES FOR VERY LITTLE PEOPLE

THE sun, one fine evening, on high
Had a side-slip and vanished, oh, my!
I know that it did,
For it left where it slid
Such a long golden streak in the sky.

OH, ring the bells! Oh, ring the bells!
We bid you, sirs, good-morning;
Give thanks, we pray—our flowers are gay,
And fair for your adorning.

Oh, ring the bells! Oh, ring the bells!
Good sirs, accept our greeting;
Where we have been, the woods are green,
So, hey, for our next meeting.

Then ring the bells! Then ring the bells!
For this fair time of Maying;
Our blooms we bring, and while we sing,
Oh, hark to what we're saying.

Oh, ring the bells! Oh, ring the bells!
We'll sing a song with any;
And may each year bring *you* good cheer,
And each of *us* a penny.

"SHALL I sing?" says the Lark,
"Shall I bloom?" says the Flower;
"Shall I come?" says the Sun,
"Or shall I?" says the Shower.

Sing your song, pretty Bird,
Roses, bloom for an hour;
Shine on, dearest Sun,
Go away, naughty Shower.

"BARBER, barber, shave a pig,
How many hairs will make a wig?"
"Four and twenty, that's enough."
Give the barber a pinch of snuff.

"AND, pray who are you?"
Said the Violet blue
To the Bee, with surprise
At his wonderful size,
In her eye-glass of dew.

"I, madam," quoth he,
"Am a Treasury Bee,
Collecting the tax
On honey and wax.
Have you nothing for me?"

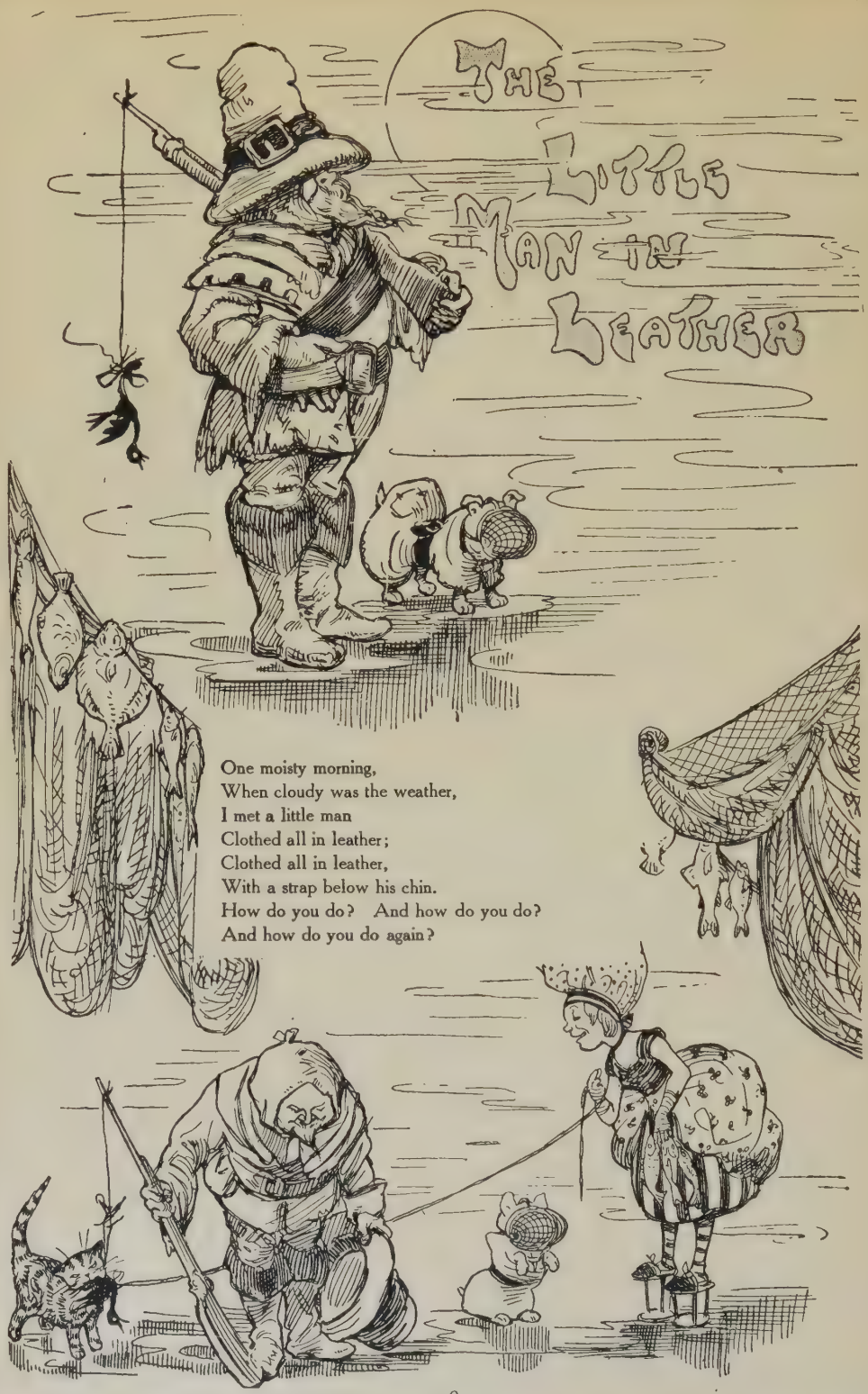
"BILLY, Billy, come and play,
While the sun shines bright as day."
"Yes, my Polly, so I will,
For I love to please you still."
"Billy, Billy, have you seen
Sam and Betsy on the green?"
"Yes, my Poll, I saw them pass,
Skipping o'er the new-mown grass."
"Billy, Billy, come along,
And I will sing a pretty song."
"Oh, then, Polly, I'll make haste,
Not one moment will I waste,
But will come and hear you sing,
And my fiddle I will bring."

TWO frogs fell into a milk-pail deep,
Croak, croak!
And one poor frog did nothing but weep,
Croak, croak!
He sank to the bottom as heavy as lead,
Croak, croak!
And there in the morning they found him dead.
Croak, croak!
The other frog shouted: "I'll have a good try."
Croak, croak!
"The pail may be deep, but I don't wish to die."
Croak, croak!
He churned up the milk with his legs fore and hind,
Croak, croak!
There's nothing like having a masterful mind.
Croak, croak!
For when the next morning this froggy was found,
Croak, croak!
On a pat of fresh butter he floated around.
Croak, croak!

A CUCKOO went back in his clock,
And shut himself up with a shock:
"I'll not strike any more,
I won't open my door;
If they want me," he said, "they can knock!"

THE robin and the red-breast,
The robin and the wren;
If ye take from their nest,
Ye'll never thrive again!

The robin and the red-breast,
The martin and the swallow;
If ye touch one of their eggs,
Bad luck will surely follow.


The Little Man in Leather
One moisty morning,
When cloudy was the weather,
I met a little man
Clothed all in leather;
Clothed all in leather,
With a strap below his chin.
How do you do? And how do you do?
And how do you do again?

Eucalyptus blossom and leaves.

A row of aloes in South Africa.

Castor-oil plants in America.

THE MEDICINE PLANTS

CONTINUED FROM 2790

A VERY large number of plants gathered all over the world is made use of in the preparation of medicines, and the discovery of the healing or preventive properties of some of these has made a great difference in the world.

The oil from the eucalyptus trees of Australia, for instance, is much used in the treatment of influenza, asthma and bronchitis, though it is only during the past quarter of a century or so that its valuable properties have been recognized. The oil is pressed out of the leaves of several species of eucalyptus trees, which are evergreen and grow very tall. One kind on rare occasions reaches a height of four hundred feet.

The flowers grow in umbels, that is, in bunches more or less umbrella-shaped, and the seeds are very small, in striking contrast to the size of the trees. The leaves are thick, smooth and leathery, and generally hang vertically on the tree.

But it is not only the oil expressed from the leaves that makes the tree valuable. The timber is very serviceable, as it is soft at first, so that it can be worked easily, but afterward it hardens and becomes exceedingly durable. As the tree grows rapidly, it has a great value commercially. In some species the bark yields tannin.

Another valuable medicine plant is the cinchona of South America, from which are obtained Peruvian bark and quinine. This is a member of the Madder Family, to which belong such well-known American plants as wild madder, sweet-scented bedstraw, bluets and button-bush.

As is the case with the eucalyptus, the cinchona often grows into a tree of great size, though in the higher mountain regions of the Andes it rarely exceeds ten feet. Climate seems to affect the growth far more than soil. Though it is found growing on many kinds of soil, none of these seems to affect the plant favorably or adversely. The cinchona is an evergreen, and the leaves are very much like those of the common laurel. The white or rose-colored flowers in form resemble the blossoms of lilac.

Up to the middle of the nineteenth century all supplies came from South America, where the work of collecting the bark is very laborious and is carried on by Indians during the dry season. The trees are felled as near the roots as possible, and then the bark is stripped and dried in the rough huts where the Indians live.

Of course, this is a very wasteful way of collecting a valuable product, and as there seemed some chance of the tree's becoming scarce, European

botanists attempted to introduce the cultivation into Europe, Asia and Africa. All attempts, however, failed, until Sir Clements Markham, the English explorer and a former secretary of the Royal Geographical Society, went to Peru and Bolivia. At great risk he secured both young plants and seeds. The story of how these were obtained and introduced into India is one of the great romances of modern botany.

The natives were very hostile to the explorer, and the Bolivian Government also put every obstacle in the way of obtaining plants. It was feared that the important monopoly would be lost. In addition, the climate where the plants had to be sought was very unhealthful, the forests were almost inaccessible, and there were practically no roads.

Sir Clements Markham did not rely on his own efforts alone. He secured the cooperation of European collectors in other districts, and eventually, in 1860, he managed to ship from Peru 456 cinchona plants of various species. Almost all these perished, but after many attempts plants were at last grown successfully on the Nilgiri Hills in India, by means of seeds, and afterward spread to other parts of India and to Burma and Ceylon. Cinchona is now grown in the West Indies Java and other countries.

An apothecary and the great thing he did for the world

No one can say definitely how the medical properties of cinchona were first discovered. Some authorities believe that the American natives knew nothing of its value or use before the coming of the Spaniards. This idea is supported by the fact that even now they never use it, and, in fact, dislike and distrust the plant. On the other hand, the early Jesuits made use of it (hence the name of Jesuits' bark). They are said to have learned its properties from one of their missionaries, who was attacked by a fever and was cured by the bark given to him by an Indian chief. Another story is that it was imported into Europe by the Countess of Cinchon, wife of the Viceroy of Peru, who in 1638 was cured of a fever by its aid. The plant is named after her, and for a time it was also called Countess's bark.

Doctors for a long time looked upon it coldly, and even after its introduction into Europe it fell into disuse. Then an English apothecary named Talbot won a great reputation by curing fevers by administering cinchona. As a reward he was appointed physician to Charles II. After he had cured that monarch by the aid of the bark, he was knighted, and then went to France and cured the Dauphin. It is said that Louis XIV bought his secret, and cinchona came into general use. Talbot did a great thing for the world in making quinine known.

Another valuable medicine plant belonging to the same family as cinchona is the ipecacuanha, a native of the dark forests of Brazil and other parts of South America. It is a shrub with long, lance-shaped leaves of firm texture grown at the ends of the branches, and heads of white flowers that develop into dark purple berries. It is the dried root that is used in medicine.

The harvest that goes on all the year round

In recent years ipecacuanha has been cultivated in India and Ceylon, but under cultivation it develops into many varieties. In Brazil it is never cultivated, and the harvest goes on all the year round, though it is relaxed a little in the rainy season, as it is then found difficult to dry the root. Its use as a medicine seems to have been known to the Portuguese in Brazil as far back as 1570.

Jalap is obtained from a member of the Convolvulus Family, closely related to our common bindweeds, to which, in character, it is very similar, though its bell-shaped flowers are not white, but reddish outside and purple inside. It is a native of Mexico, but has been introduced into India, and will grow freely in temperate climates. Sometimes, as the flowers come late in autumn, they do not expand, and the root from which the medicinal matter is obtained is liable to be destroyed by frost.

Why a plant from China is known as Turkey rhubarb

Turkey rhubarb is the root of a plant that grows in China. It obtained its name from the fact that it formerly reached Europe by way of Asiatic Turkey. It is a member of a family familiar to us on account of the rhubarb stalks that provide so excellent a substitute in spring for summer fruits. It is closely related to the docks and sorrel of the English countryside. Probably several species of rhubarb in central China yield this useful drug, but exactly which these are is not quite certain.

The bitterwood tree, which is a native of Jamaica and some other West Indian islands, now provides the quassia used in medicine, though this drug was formerly obtained from another allied plant. The bitterwood is a tree that grows fifty or sixty feet high, and is in appearance something like an ash. The flowers, which are inconspicuous and green, develop into black, shining drupes about the size of a pea. The drug used in medicine is obtained by infusing chips of the wood.

THE USEFUL GUM WHICH IS DUG OUT OF THE GROUND IN PERSIA

Asafetida is a gum obtained by drying the milky juice which exudes from the roots of a tall herbaceous plant called the *Ferula fetida*. The roots are several inches thick, and the collection of the asafetida takes place in the mountains of southern Persia, where the natives remove the soil and lay bare part of the root. They cover this up again for about six weeks, and then, uncovering it once more, slice off the crown of the root. Two days later they scrape from the surface the juice that has exuded. The root is again covered up temporarily, and the process of tapping is twice repeated. The harvesting of the gum takes place in April and May, when the leaves have begun to decay.

Orris root, a name which is probably a corruption of iris root, is the rootstock of several species of iris, members of the family that includes the blue-flag of the countryside. It grows in the south of Europe, and the root was formerly used in the preparation of many medicines as a stimulant, but is now very little used, except as a perfume.

Sassafras is a North American plant that varies in size from a small bush to a tree fifty feet high, according to whether it is grown in the north or the south of the continent. The bark of the root yields a powerful stimulant much used in medicines. It is a member of the family to which the European laurel belongs.

THE BITTER ROOTS THAT ARE THOUGHT TO RELIEVE RHEUMATISM

Sarsaparilla, sometimes given for rheumatism, is obtained from the dried root of the Smilax Family, a native of Central America. Several species yield the substance, and all of them are twining shrubs that grow only where there is plenty of water. The leaves are oval and pointed, and the staminate and pistillate flowers are on different plants. The fruit is a three-celled berry containing two seeds. The root has a somewhat bitter taste, and, when soaked in water, makes the liquid red. The root was introduced into Europe more than three centuries ago and has been used for medicinal purposes ever since. Most of the European supplies come from Jamaica, but various species of smilax grow in the United States, India, Australia, Mauritius and the Philippines. The rootstocks of some of these are very large; one kind in the United States is used as a food for hogs, while another yields a useful dye.

The aloe from which bitter aloes are obtained is a member of the Lily Family, and is a native of the warmer countries of the Old World. It grows abundantly in the southern part of Africa, but there are many species. Some are found in the East and West Indies. The plant from which the aloes of the chemist are obtained has a strong fibrous root, bearing stems of three or four feet with terminal spikes of purple-striped flowers. The numerous leaves all grow from the upper part of the root and are narrow, tapering, smooth and fleshy, with spiny teeth along their edges. It is from these leaves that the drug is obtained. When they are cut across, a resinous juice comes out and is dried. Sometimes it is boiled out of the leaves.

WHY THE MOSLEM HANGS THE ALOE OVER HIS FRONT DOOR

Among the Mohammedans the aloe is a symbolic plant, and every Moslem, on returning from Mecca, hangs this plant over his street door as a token that he has performed the pilgrimage. In Africa ropes, fishing-lines and bowstrings are made from the fibre of the leaves. The aloe from which bitter aloes are obtained must not be confounded with the American aloe, or agave, a plant belonging to quite another family. That is a member of the Amaryllis Family, which includes among its members the daffodil and snowdrop. In appearance, however, the agave is something like the aloe of the druggist.

Senna consists of the dried leaflets of several kinds of cassia grown in Africa and India. These are leguminous plants, near relatives of the pea and bean. The long spikes of yellow flowers develop into seeds that are contained in a compressed, curved pod. The stalk is strong, smooth and branched, rising to a height of about two feet. The leaves are made of several

pairs of pointed oval leaflets of a yellowish green color.

The castor-oil plant is a native of India, though it has now been carried to most other warm countries. Even in Northern Europe it grows six or seven feet high, and is much favored as an ornamental plant; but in the warm lands it becomes a tree of eighteen or twenty feet. The flowers are small, but the foliage is very handsome. The castor oil used as a medicine is obtained from the seeds, which are passed between rollers and then placed under hydraulic pressure in hemp bags. The darker-colored oils are bleached by exposure to the sun's rays. Italian castor oil is colorless and practically tasteless, and is in great demand. Like so many other articles of commerce, castor oil is often adulterated, sometimes with lard.

Another member of the Lily Family which yields a useful medicine is the squill, a native of the Mediterranean and Caucasus, and a near relative of the wild hyacinth. It is also a relative of the aloe. The medicinal properties are contained in the bulb, which is about the size of a man's fist and so acrid that, if handled much, it blisters the fingers, and the vapor that it gives off greatly irritates the eyes and nose. The bulb is dried slowly, and then cut up and powdered.

A PLANT OF GREAT VALUE AND ITS POWERS FOR GOOD AND EVIL

The opium poppy is a very valuable plant on account of the drug obtained from the dried juice of the unripe capsules. This has been described as one of the most valuable of all medicines, but, like so many other useful things, it has been greatly abused, and has done an immense amount of harm. Nevertheless, it is necessary to grow a certain quantity of opium poppies in order that doctors may have the drug available as a medicine. It is grown largely for this purpose in India and also in other countries. The plant requires a rich, fine soil and much manuring. A dry climate greatly reduces the quantity of juice, but very wet weather is far more harmful.

An oil as sweet as olive oil is also obtained from the seeds. It is perfectly wholesome as a food and is much used in France. In fact, it is said that about half the oil used for cooking in France is poppy oil. It is also used much by painters.

In India, where such a large quantity of the opium poppy is grown, the seed is sown in November and the plant flowers at the end of January or beginning of February. Three or four weeks later, when the poppy-heads are about the size of a hen's egg, they are ready for tapping. The collectors go through the plantations in the afternoon and pierce the poppy-heads with an instrument that is made up of four blades fastened together. The next morning the men again go through the plantations and scrape off the sap that has exuded from the wounds. They place it in earthen vessels, and, on returning to the house, spread the juice out on shallow brass dishes tilted to allow any water to run off.

THE NUX VOMICA TREE OF THE EAST INDIES AND ITS DEADLY FRUIT

Every day it has to be turned so that it may dry properly, and after three or four weeks it is packed into earthen jars and taken to a factory, where the mass is kneaded in great vats and made into cakes, the form in which it reaches the market.

Atropine, or belladonna, used by oculists for the dilation of the pupil of the eye is a product of the deadly nightshade, one of the most poisonous and dangerous of all American wild plants. It is described in The Flowers of the Poets.

Nux vomica is a tree found all over the East Indies that grows about forty feet high and yields a brownish gray timber that is bitter to the taste. As it is close and hard-grained, the wood is used in Burma for the making of carts. The nux vomica used in medicine is obtained from the flat circular seeds that grow imbedded in large numbers in the juicy pulp of a fruit something like the orange. Strychnine and brucine are both obtained from nux vomica seeds. Mixed with meal, the seeds are used as a rat poison.

HOW CAMPHOR IS OBTAINED BY BOILING THE WOOD OF A LAUREL

Tragacanth, a member of the Leguminous Family, is a native of Asiatic Turkey, where it grows as a low shrub. It has a short thick stem with rigid brown fibres and armed with sharp spines. A gummy secretion comes out through cracks and through slits cut in the stems, and dries into the tragacanth gum of commerce. Since it is without smell or taste, it is used largely to give firmness

to pills and lozenges. It is also made into a gum for stiffening calico and crepe.

The camphor laurel, a tree that grows in China and Japan and other countries of the Far East, and also in the West Indies, yields the camphor we know so well as a soft white semi-transparent substance with a strong aromatic odor. This is a solid, essential oil, and is obtained by cutting the wood of the tree into small pieces and boiling it in water. The oil rises with the steam and distils on the top of the vessel. It hardens when cold, and after arriving in Europe from the East it is again refined.

The camphor tree grows abundantly in the woods of Japan and China, and it is found as a hothouse plant with us. The root, wood and leaves all have a strong odor of camphor, which is found in the tiny openings of the fibres of the wood, especially at the knots.

Coca, a plant which has no connection with cocoa or coconut, is a shrub that grows in Bolivia and Peru and yields a useful drug known as cocaine, which, however, has been frightfully abused in recent years, and used by all sorts of people. Such a dangerous drug should, of course, never be used in any form except under strict medical advice. Indeed, so dangerous is the drug that some doctors have suggested that its production should be altogether prohibited by civilized nations. Doctors themselves could use another drug in its place. Though it exhilarates for a time, the after-results are terrible. The coca bushes grow on the sides of the mountains and yield three crops of leaves a year. The drug is obtained from the leaves, which are dried.

The gamboge tree grows in Ceylon, Siam and other Eastern countries, and reaches a height of forty feet. When the bark is pierced, a gum-resin exudes which is known as gamboge and is much used in medicine as well as in the arts. It comes out as a thick yellow fluid, and hardens on exposure to the air. It is generally sold in sticks, as it is collected in its gummy state in rods of bamboo. The plant has smooth oval leaves, small flowers, and clusters of sweet fruits.

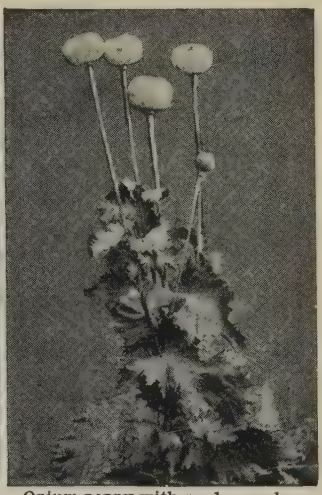
Arnica is a member of the Composite Family of plants including the daisy and dandelion, and it grows in Germany, Switzerland and other European countries. The flowers yield a tincture much used as an outward application for bruises.

Myrrh is a small, scrubby tree growing in Arabia, Somaliland and India. It has gray bark and small leaves, and from the bark exudes a gum-resin used in medicine. This comes out in the form of yellow drops that harden and darken in the air. It will be remembered as one of the gifts brought to Jesus by the Wise Men.

Another leguminous plant useful in medicine is the licorice, a native of Southern Europe, now grown in Asia. It is often cultivated in England, and from the roots is extracted the black licorice so well known to boys and girls.

Belladonna, or deadly nightshade.

A cinchona tree.



Opium poppy with seed capsules.

Photos New South Wales and South African Governments, and Messrs. Burroughs, Wellcome.

THE NEXT STORY OF PLANT LIFE IS ON PAGE 2991.

THE SPONGES AS WE FIND THEM

It is odd to think that the sponge we use was once alive, and is an animal product, not a vegetable growth, as it seems to the eye. The sponge lives in the sea, breathing oxygen like a fish. Water is drawn into it through little pores, and the food the water contains is devoured, the water passing out.

Sponge photographs, courtesy Creswell Brothers, Limited.

A diver going down to the sea bed for sponges.

THE SPONGE AND WHAT IT IS

CONTINUED FROM 2802

THE common sponge is a familiar object, yet very few people know what a sponge really is. Most people wrongfully imagine that it is a sort of seaweed. Nor is it very strange, perhaps, that people should not know its true nature, for it was formerly one of the puzzles of science, and even yet it is in some ways rather a problem.

One old writer imagined that sponges were made out of the foam of the sea; another thought they were worm houses, built by worms much as bees build honeycombs, and wasps nests; and another thought they were half bird, half animal. As a matter of fact, the sponges are really very lowly animals.

Animals are divided into two great classes—those made of single cells and those made of more than one cell. Sponges are the lowest form of the second class. They consist of many cells, and the dry material we use for the bath is the horny skeleton of the cell which holds them together and gives them shape.

The fibrous skeleton has tiny cells plastered all over its surface in such a way that it forms a porous mass. The mouths and tiny pores on the outside lead into a network of tubes large and small. The cells set around the pores and mouths, and lining the passages, have little finger-like processes which all move together. A stream of water flows in at the pores and out again at the mouths. In this way food and the gases in the water are made to circulate to all the cells.

There are male and female sponges, and the female sponges produce eggs that develop into single cells. At first they go swimming through the water, but afterward they take root and form such elaborate compound structures as we have attempted to describe.

There are sponges of all shapes, sizes and colors. Some are the size of a pin-head, some as tall as a man; some are fan-like, some tree-like, some cup-like, and some basket-like; some are built on a horny framework; some are made of lime; some have a glassy frame. Some are snow-white, some grass-green, some sky-blue, some red, and some yellow.

The Greek and the sponge are closely connected. Long, long ago in the clear rock-sown seas around Greece the young Greek diver toiled to bring up the curious sponge masses; the ancient warriors used sponges to pad their helmets; Greek merchants brought sponges into the London market early in the nineteenth century; and Greek divers, who learned their art in the Mediterranean, are the chief sponge-fishers in the waters of the Gulf of Mexico to-day.

WHERE DO WE GET ALL OUR SPONGES?

Less than a century ago all the sponges used in this country were imported from the Mediterranean and Red seas; to-day many of them come from the warm clear waters off Florida, in the Gulf of Mexico, and the West Indies. When they were first found growing off the island of Key West the sponge-fishermen used to go out, two in a small boat, to fish for them. The man in the stern sculled the boat, and the one in the bow hooked the sponges. The hooker was armed with a long hook, 45 or 50 feet in length, and a water-glass—a bucket with a glass bottom—tied to the side of the dinghy. Pushing the water-glass beneath the ripples on the surface, the hooker rested on the thwarts facing toward the bow and pushed his head as far down into the bucket as possible. As soon as he sighted a sponge he dropped the water-glass and grasped his hook with both hands. A little hoist and he landed a fine sponge in the boat. His mate meanwhile was sculling very smoothly and gently along, so as not to cause the hooker a strain nor cause him to lose his balance.

HOW THE DIVER GATHERS UP THE SPONGES

To-day, however, most of the sponge-fishing is done by expert Greek divers clad in modern diving suits and carrying with them mesh bags in which to collect the gluey, strong-smelling masses. The water in which the diver works is so clear that there is little danger except from sharks, which abound. These he cannot attack with a knife, for the scent of blood would draw others to the spot; all he can do is to remain perfectly still, for the shark will soon leave anything that seems dead.

Basketful after basketful is drawn up to the boat above, and then the sponges are carried to the big ship, where they are spread on deck until the slimy matter has drained out of them. While this dying process is going on, the sponge gives off a very strong, disagreeable odor, which gradually lessens till it resembles that from seaweed. When the schooner has made her haul, she returns to her port, and the sponges are put in kraals like those shown at the bottom of page 2918—in order that the tide may wash them out thoroughly. After a week in the kraals each sponge is taken separately and squeezed and beaten with a stick till all the living matter has disappeared. Finally it has to be bleached, and, according to its kind, this is differently done. The fine sheep's-wool variety is washed in very soapy water and, covered with soapsuds, is hung in the air and sun and dew. The more common yellow sponge is bleached with a solution of lime, or an acid and sea-water, although acid sometimes weakens the fibre of the sponge.

THE FINEST SPONGES COME FROM ABROAD

Though most of the sponges used in America come from the waters around Florida or the West Indies, the finest quality still comes from the Mediterranean and Red seas, where sponges have been gathered from the same waters for many centuries. The sponges of the Western World are generally coarser than those of the East. Though sponges are not used so much in surgery and in the bath as in former times, new uses have been discovered, and the demand continues heavy.

The beds of sponges are rapidly becoming depleted because they are constantly fished, without allowing time for the young sponges to mature. Because of this the United States Government has passed laws forbidding divers to take sponges between the first of May and the first of October. Revenue cutters have authority to seize boats engaged in fishing during the closed season. Further, the cultivation of sponges is being seriously considered, although as yet the process for growing them costs too much for commercial purposes.

HOW SPONGES ARE REARED ARTIFICIALLY

Bits are cut from a live sponge, and each of these is fastened to a sort of base, usually made of cement. This is sunk into shallow water, and the sponge may grow so rapidly that it can be taken up the next year, or in two years at most. Some of the sponges die, however, and some of the bases are lost, so that the expense is large and not many sponges are yet grown in this way. Some day we may have to depend upon this method if the public waters are fished so constantly. Another way is to string the bits of sponge on wires hung in shallow water. Perhaps some kinds of sponges may be reared from their eggs.

THE NEXT STORY OF FAMILIAR THINGS IS ON PAGE 3041.

PICTURE-STORY OF A SPONGE

In Florida sponge culture is sometimes carried on artificially. Small portions of sponge are strung on a wire made of lead with a copper core, and this is suspended in shallow water. In six months the fragments have grown into sponges six times their bulk. Sometimes the pieces are fastened to cement slabs.

Off the coast of Florida divers descend from boats to the ocean bed and there gather the sponges by plucking them with their hands. The sponges are placed in a large net bag which the diver carries, and when this is full it is pulled up. The boat, guided by the bubbles of his expended breath, keeps just above.

SPONGE-DIVERS AT WORK IN THE SEA

Most of the sponges are obtained by divers in the Mediterranean, the West Indies and off Florida. Here are boats in the Mediterranean Sea and divers stripping the sponges from the rocks. Men who wear diving dress can stay under water for hours. The man diving from the boat on the left has no diving dress.

Here the sponges are being roughly cleaned after being brought ashore by the boats. There is a thin skin over the sponge, and in all the pores and canals is a slimy, sticky substance, which is the life-matter.

This is a scene on the coast of Florida. The sponge-fishers build inclosures of poles in the water to store the sponges taken in deeper water. The action of the water makes it easier to remove the slime and skin.

DRYING THE SPONGES IN THE SUN

Here are the sponges brought in by the two boats—big, good sponges which have been gathered by hand from the depths of the sea. Some divers tear the sponges away with pronged forks, but this injures them.

The sponges, having been washed and cleaned, are put out to dry on wooden racks, and are then sent from this place in Florida to the dealer. New uses for sponges are constantly being found.

GIVING THE SPONGE A BATH

Many sponges arrive in a rough state and need cleansing. These sponges are in an acid bath.

After their bath the sponges are run through a mangle, where much of the acid is squeezed out.

Then, after another thorough washing, the sponges are placed on racks in a warm room and left to dry.

When quite dry they are trimmed to a suitable shape. All jagged ends are cut with a knife.

The smaller sponges are trimmed by girls using scissors, who sit with the sponges before them.

Finally the sponges are sorted according to quality and size by men who have expert knowledge.

A Rainy Day.—From the painting by Frederick Walker.

THE RAIN THAT RAINETH EVERY DAY

CONTINUED FROM 2794

IF we stand on the seashore and watch the waves, we see that the wind is always trying to lift the water. At the same time the weight of the water, or the force of gravity, is always trying to pull it down, so that the waves constantly dance up and down. The air in which we live is, like the water of the sea, continually being acted upon by outside forces. Since it is a gas instead of a liquid, it is very much more responsive to these forces than water.

The changes which go on in the air constitute what we call weather. The study of the weather is a very complicated subject, but there are a good many facts about it which are quite easy to understand.

Here we shall read of only one of the many ways in which air is subject to change. We shall study about the quantity of water-vapor which it contains. Water, like most liquids, is volatile; it can exist not only in the form of a liquid, as we commonly see it, but also as a gas, or vapor. Millions of tons of water-vapor are always being carried about in the air, and this vapor plays an important part in producing weather.

The amount of water which air can contain depends somewhat upon its temperature. Warm air can hold a great deal, cold air only a little. When air has taken up as much water as it is capable of supporting without being warmed, it is said to be saturated. Air which is not completely saturated will always take up more water wherever it can find it, and it is this process which is known as evaporation. We can thus understand why sheets dry more easily in warm weather than in cold, or in front of a fire rather than in a cold room. The warmer air can the more readily take up the water and turn it into vapor.

As long as the water in the air remains in the form of vapor it is quite invisible, and the air is clear. But suppose something happens to chill the air. If cooling goes on long enough, the air will no longer be able to hold all the water-vapor. When this happens, some of the vapor recondenses, or turns back into liquid water. The temperature at which this change occurs is called the dew-point temperature.

There are many ways in which air can be chilled, and the condensation of water takes many forms. One of the first ideas which might occur to us is that the air is cooled when a cold wind blows. A little reflection shows that this would be a mistake.

A cold wind merely drives away the warmer air around us and replaces it by colder air. This is quite a different thing from cooling it, and it is only by cooling air that it can be made to give up its moisture.

An example of the cooling of air can be observed on almost any fine summer night. On clear nights a great deal of heat escapes from the ground and is radiated into space. The soil thus becomes chilled, and this in turn cools the air in contact with it. When a thin layer of air near the ground has had its temperature reduced to the dew-point temperature, the water it contains begins to condense in tiny droplets of dew on the ground, and on the stems and leaves of plants.

THE BEAUTIFUL AND CURIOUS SHAPES FORMED BY FROZEN DEW

Artificial dew may be formed if the air is cooled suddenly. Thus, if a glass of ice-cold water is brought into a warm room, little beads of water will appear on the outer side of the glass. People often speak of "dew falling," but of course this is not true.

When the formation of dew occurs at a temperature below the freezing-point of water, the condensed moisture takes the form of minute ice-crystals, or hoarfrost. These crystals are extremely beautiful in shape, and worth examining under a magnifying glass. When deposited on a smooth surface, like a windowpane, these crystals often form beautiful patterns.

The condensation of water from the air takes place normally on the surface of some solid substance. In the case of dew we have seen that it forms upon the ground or on vegetation. In the free air innumerable particles of dust float. They are mostly extremely small, and generally are invisible, though some of the larger particles can sometimes be seen in a strong light.

The dust consists of finely divided fragments of soil, the pollen of plants, soot and numerous other substances. Ordinary smoke consists of solid specks of soot so small that it has been calculated that a single puff of cigarette smoke contains about 4,000 million separate particles.

THE DIFFERENCE BETWEEN A COUNTRY MIST AND A TOWN FOG

When the free air is cooled it is upon this dust that the condensed water settles. Though previously invisible, the moistened particles absorb so much light that they make the air opaque. This explains the formation of mist, which is formed only when the air is damp and chilled below its dew-point temperature.

Fog is similar to mist, and is often formed on smoke particles. Smoke dust is usually full of oily substances, like coal-tar. This causes a thin film of oil to form on the surface of the water-drops, which prevents them from re-evaporating easily. Fog is, for this reason, more persistent than mist; when once thoroughly established, a thick London fog will sometimes last for several weeks. Banks of fog are sometimes blown bodily across the country by the wind. Dense fog nearly always disappears if rain begins to fall. The rain washes the fog particles out of the air.

Owing to the way in which they are formed, fog and mist do not extend to any great height. In an ordinary town fog the tops of high buildings are often in clear sunshine. Country mists are sometimes extremely shallow.

When the condensation of water-vapor occurs high above the ground, the banks of mist, which we see only from the under-side, are what we call clouds. A cloud is exactly the same as a mist, but it is formed in a different way. To understand the origin of clouds it is necessary to understand that wind does not always blow in a horizontal direction but also, to a certain extent, up and down.

ONE OF THE MOST IMPORTANT FACTS ABOUT THE WEATHER

Now, when air is moving downward, it is being compressed and this makes it warmer. When it moves upward, it is expanding and therefore becoming colder. In the first case, no water-vapor can condense; in the second, it will condense readily. Air which is moving downward toward the ground is therefore clear and free from cloud; while air which is moving upward away from the ground is usually cloudy. This is one of the great discoveries of meteorology.

Clouds take many, and often very beautiful, shapes. These depend principally upon the conditions in which they are formed. One of the best-known kinds of cloud is the cumulus, which is like a great mass of cotton-wool of dazzling whiteness.

Cumulus clouds are sometimes of immense size, exceeding a mile in thickness

and several miles in length. In their early stages they are the great columns or pillars which we see rising into the sky on a warm summer day. They are no doubt caused by great upward streams of overheated air, and usually mean thunderstorms. After a time they break up into scattered fragments, which drift before the wind and gradually disperse.

These old and dying clouds must be distinguished from the rounded masses of newly formed cloud often to be seen covering the greater part of the sky. These clouds are of all sizes down to tiny fluffy scraps, and nearly always appear in a sort of network or in ribbed waves. The well-known "mackerel sky" is of this variety. Such clouds commonly foretell rain.

THE CHANGING SHAPES OF CLOUDS AS THEY RACE ACROSS THE SKY

Another very beautiful cloud is the cirrus. It consists of fine wisps of delicate texture floating at a great height. Occasionally it trails long filmy streamers of snowflakes. Cirrus clouds are the highest of all visible clouds and consist of ice-particles instead of water-drops.

The long straight clouds that we see in the evening, like bars across the sunset sky, are known as stratus clouds. They are old, or "degraded," clouds which are gradually sinking to the earth and being re-evaporated. Stratus clouds are sometimes very large flat sheets of cloud. They appear as bars because we can see only their edges.

When the cooling of air, which has been caused by its ascent, continues after a cloud has been formed, the little drops of water of which the cloud is composed run together into larger drops. And, when these become heavy enough to overcome the resistance of the upward-moving air, they fall to the ground as rain. The size of the raindrops depends on the rapidity with which they are being formed. In other words, it depends on the speed of the moving air.

HOW THE WINDS AND MOUNTAINS BRING RAIN TO THE EARTH

One of the commonest ways in which air is forced upward is by wind blowing against the slopes of hills. For this reason there is a great deal of rain in places where hills stand in the track of damp sea-breezes. At Vancouver, British Columbia, the rainfall is about three times as great as on the plains of Manitoba. On the west side of the Sierra Nevada the rainfall is from four to ten times as much as falls on the east. In hilly districts water runs away from the ground quickly, and unless they had more rain than the plains, the streams would often be dry.

The rain caused by hills is known as *orographical*. It is seldom very heavy, but is remarkably frequent and persistent. Masses of cold and dense air can act in the same way as hills in producing rain. Thus, if a warm, damp wind blows against a bank of cold air, it rises over it and causes rain. Such a rain may keep on for a long time, and is just as likely to fall in the lowlands as in the hills. Sometimes a cold wind forces its way under warm air, lifting it bodily from the ground. Rain caused in this way is of the squally type, and falls in short, sharp, cold showers.

Another kind of rain is brought about by masses of air becoming heated and rising above the cooler air around it. This is known as *convectional* rain. It occurs in April showers and summer thunderstorms, but very seldom in winter. In the tropics most of the rain is of this type. Convectional rain is sometimes very heavy, and falls in violent showers of large drops; but in temperate climates it seldom lasts more than an hour or two.

HOW SNOWFLAKES AND HAILSTONES ARE FORMED UP IN THE AIR

When moist air is sufficiently cold, the condensed water takes the form of ice-crystals—just as it does in the case of hoarfrost. These ice-crystals often melt into rain before they reach the ground; when they do not, they reach us as snowflakes. A snowflake is a tangled mass of minute hexagonal crystals. It is said that of all the billions of snow-crystals that fall no two are ever exactly alike.

Occasional snow is extremely valuable in agricultural districts because it brings down a great many substances from the air which help to enrich the soil; and by lying in the ground, instead of running away like rain, enables them to soak and manure the soil. It also protects plants and roots in the south.

Hail is quite different from snow. In the case of snow the ice forms in the process of condensation, but with hail it forms afterward. Hailstones are therefore simply frozen raindrops, or else flakes of snow surrounded by ice. Hail

is caused by the drops being blown upward instead of falling downward, and thus being carried into the very cold, moist upper air. True hail occurs only when the updraft of air is very powerful.

Hailstones are frequently carried upward several times after they have begun to fall; and as they receive a fresh coat of ice every time this happens, they may become very large. If a large hailstone is carefully cut in half the separate coats can be seen.

How Thunder and Lightning Are Caused by Drops of Rain

Lightning is caused in an interesting way. When raindrops are very large they break up, in falling, into smaller drops. This breaking up causes a separation of the positive and negative electricity on the surface of the drops. When similarly charged drops run together again the amount of electricity is greatly increased. If the charge becomes too great for the drops to bear, an electric current passes from the cloud in which the rain is forming to another cloud, or to the earth. The air in the path of this current is suddenly heated; hence the blinding flash.

Thunder is, of course, the vibration caused by the sudden expansion and contraction of the heated air. Though thunder sounds like a continuous roar, it is practically an instantaneous explosion. The roar is caused partly by the fact that the flash is usually several miles long. The sound from different parts of it reaches the ear at different moments; and the echo from adjacent clouds or hills is also heard.

Many photographs have been taken of lightning, and they show that the flash is invariably ribbon-shaped—a long, irregular line, sometimes with a number of branches like the branches of a tree. It is never zigzag as it is often drawn in pictures. "Summer lightning," or heat lightning, is not a different variety, but is merely caused by the flash being below the horizon, or behind a cloud, so that only the reflection is seen.

Thunderstorms may occur at any season, but as very violent ascending air currents are far more common in hot weather than in cold, they are much more frequent in summer than in winter. Winter thunderstorms, however, do occur.

Winter lightning is said to be far more dangerous than summer lightning, because it is accompanied by less rain. Rain in a thunderstorm acts as a lightning conductor, carrying a great part of the electric charge safely to earth. The most likely time to be struck by lightning is in the early part of a storm, before much rain has fallen.

The Great Clouds That Act as a Blanket to the Earth

But the moisture in the air has other duties to perform in the economy of the weather. It plays a great part, particularly in the form of clouds, in tempering the heat of the sun. Clouds absorb a good deal of the solar energy which falls upon them. Part they reflect back into space, so that it does not reach the earth at all. Clouds in this way protect vegetation from excessive sunshine.

Clouds not only intercept some of the sun's rays before they reach the earth, they also prevent heat from being radiated away from the earth. On this account cloudy weather, though usually cooler in the daytime than clear weather, is often warmer at night. Clouds, in fact, act like a blanket, which is equally useful for keeping ice cold or the body warm.

Much of the light by which we see is reflected from clouds and reaches the eye greatly softened. Clouds absorb some of the solar rays more readily than others, the red rays passing through most easily of all. This is the reason that the sun has a blood-red appearance when seen through a fog, or at sunset.

The Complex Weather Machine, and How Men Study It

Understanding what causes different kinds of weather is the first step toward understanding the weather as a whole. It would be useless to try to understand the working of a clock or a motor car if we were not familiar with the parts of which it is built, and with the way in which each part works.

The way in which the weather can be studied most satisfactorily, therefore, is to arrange for a very large number of people in different places to observe what is going on at the same time. Weather observations are best made by means of instruments, such as the barometer, thermometer and rain-gauge, because instruments enable us to measure very exactly instead of recording what we *think* is taking place. Some of the work of observation is so simple that any boy or girl can really do something to help.

THE NEXT STORY OF THE EARTH IS ON PAGE 3033.

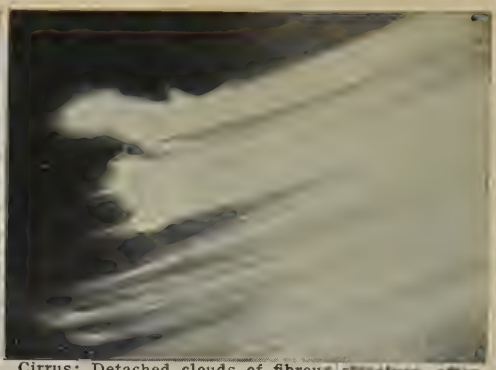
PHOTOGRAPHIC ATLAS OF CLOUDS

An International Meteorological Committee has decided on a world classification of clouds based on the four main types—the cirrus, or thread cloud, the cumulus, or heap cloud, the stratus, or flat cloud, and the nimbus, or rain cloud; and these pictures, showing the various combinations of these four types, are from the official cloud atlas of the Meteorological Office.

Fracto-cumulus: Drifting groups of cumulus clouds torn by the wind and floating a mile high

Alto-cumulus: A layer of large cloudlets in waves or rows, floating at a medium height.

Strato-cumulus: Lumpy masses or rolls of dull gray cloud in irregular order, about a mile high.



Cirrus: Detached clouds of fibrous structure, often called mares' tails, about six miles up.

Cumulus: Sometimes known as Woolpack or Cauliflower Cloud. The height is about a mile.

Stratus: A uniform layer of cloud like fog lying about half a mile above the ground.

Alto-stratus: A dense sheet of gray or bluish color floating from two to five miles above the ground.

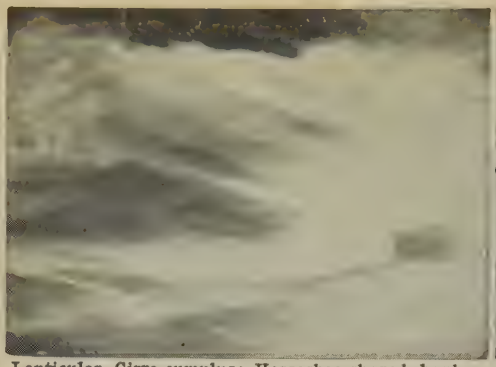
Mammato-cumulus: The last stage of cumulo-nimbus. It is sometimes called festoon cloud.

Nimbus: A dense layer of dark, shapeless cloud, with ragged edges, a mile and a half up.

Cumulo-nimbus: Thunder clouds—great masses rising in the form of mountains, two to five miles up.

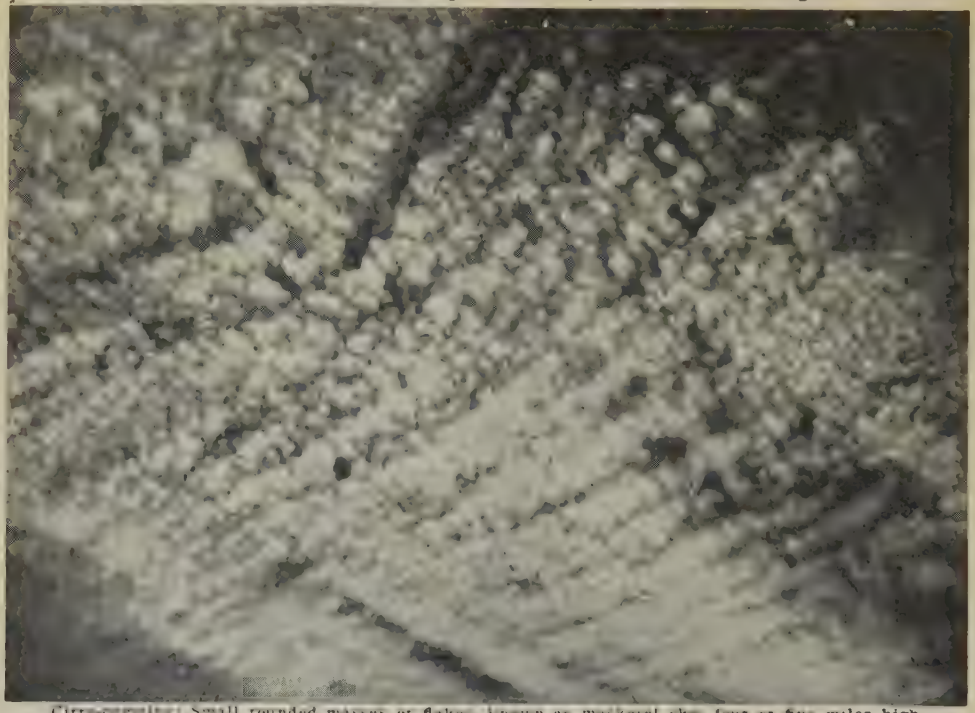
Cirro-stratus: Floating five or six miles up, with a string of fracto-cumulus below, just over a mile high

Cumulo-nimbus: Thunder cloud completely covered or veiled by a great screen of false cirrus.



Lenticular Cirro-cumulus: Horseshoe-shaped banks of cloudlets that sometimes assume an almond shape.

Fracto-stratus: Stratus clouds divided into ragged masses by the wind and drifting low.



Cirro-cumulus: Small rounded masses or flakes, known as mackerel sky, four or five miles high.

Lenticular Alto-cumulus: Banks of cloud of an almond or airship shape, with sharp general outlines.

Cumulo-nimbus: A typical example of a spring shower cloud bringing rain and hail.

Dublin Castle, the official home of the Irish Free State Government.

THE STORY OF IRELAND

CONTINUED FROM 2836

LIKE the history of all countries, the early history of Ireland is lost in myth. At the first date of which we can speak with certainty the island was already inhabited by Celts; but tradition tells of ancient people who lived there long before ever the Celts crossed the Channel in little coracles—skin-covered boats such as were in use down to a late date in the Arran Islands on the western coast. Our first real knowledge of the Irish people is gained from the writings of Ptolemy, a Roman historian, in whose time, and for long after, they were known as the Scots. It is thought that even then the country had been divided into something like its present divisions, Ulster, Munster, Leinster and Connaught, under the rule of kings. But each of these divisions was subdivided into smaller kingdoms, which again were divided into clans, or septs. The chiefs and kings were not always succeeded by their eldest sons. During the lifetime of the chief the people chose from his family the man whom they wished to govern them, and henceforth he was looked upon as the heir, and was called the "tanist." From among the four chief kings a high king, or ardri, was chosen for life, and some time after the period of which we are now speaking, a fifth kingdom, the kingdom of Meath, was carved from the other four and given to the reigning high king as his domain.

The religion of the people was very much like the religion of the Britons. Their priests, like the British priests, were called Druids, and next to the kings they were the most important people in the country. After them in importance came the bards, who sang of the deeds of the kings and chieftains, and carried down their traditions from generation to generation. There were schools for these bards and also for the Brehons, or judges. Every third year the high king called a great council at Tara in Meath, and there the Brehons interpreted the laws to the assembled chiefs. Under the Brehon Laws no man could inherit land, for the land was held to be the common property of the tribe; it did not, as among the Teutonic peoples, belong to the king. Therefore the king could not bestow it upon knights to hold as his men. It is important to remember this fact because it is partly owing to it that no Irish king ever gained enough power to weld the people into a really united nation.

THE COMING OF ST. PATRICK TO IRELAND

There are many traditions of famous men in these ancient times, to which all Irish people like to look back, and one of the most important was that of Niall of the Nine Hostages, who was high king for years. Niall made many raids into Britain, and among the captives taken on one of these was a youth about sixteen years old, a native of Dumbarton, or, some say, of Gaul, who became the slave of a chieftain named Melchus. For seven or eight years he herded his master's flock on the mountains of Antrim. Then he escaped and went back to Britain, where he was ordained a priest. From Britain he went to Gaul, and from Gaul, some say, to Italy. But the thought of the island he had learned to love weighed heavy on his heart, and he turned back, determined to win its pagan inhabitants to belief in the Christian faith.

He tried to land on the coast of Wicklow, but the people there would not have him, so he sailed up the eastern coast and landed on the shores of Strangford Lough. Thus it was that the great St. Patrick came a second time to Ireland, this time not as a slave, but to bring it the blessings of Christianity. Wherever he went he made converts of chiefs and people, and before he died the whole island was won. Many stories are told of the simplicity and clearness of the teaching of the saint and of the holiness of his life. Everyone knows the story of how he taught the great Christian doctrine of the Trinity by plucking a leaf of shamrock and pointing to the three perfect leaves growing from one stem. From that day to this the shamrock has been used as the emblem of Ireland.

Then began the days of Ireland's glory. Great monasteries were founded, schools were established to which students flocked in hundreds, and learning spread among the people. Music and the goldsmith's art flourished, and some of the most beautiful manuscripts of medieval times were written by monks in hermit cells in the great monasteries. With the love of the Gospel they had learned in their hearts, young men went out as missionaries to teach it to the Picts in Scotland and to pagan Angles and Saxons in Britain, to the Gauls in France, to the many Teutonic tribes in the forests of Germany, to the Frisians on the shores of the Baltic, to the Lombards in northern Italy.

THE LEARNING OF THE IRISH MISSIONARIES

At a time when the dense darkness of ignorance covered Europe Irishmen were learned. The fame of their learning spread, and crowds of young men from other lands flocked to the monastery schools in Ireland to be taught. Irish missionaries carried the light of religion abroad, and schools and monasteries were founded by them in Central and Eastern Europe. One of the greatest of these missionaries was St. Columba, who founded the monastery on Iona; another was Aidan, who converted all of northern England; St. Gall, who gave his name to a town and canton in Switzerland, was still another; and these are only a few of the names that are remembered. But through all this life and learning, the lot of the people at large does not seem to have been happy. The high king, or ardri, was never strong enough to keep peace in the land. The kings of the provinces and the chiefs of the clans were at constant war with one another, and there was no unity among them.

BRIAN BOROIHME, WHO DESTROYED THE POWER OF THE DANES

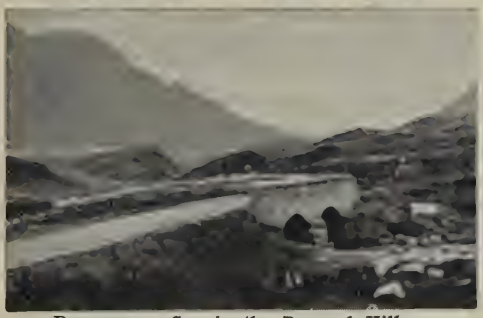
The time was coming when unity was sorely needed. At the end of the eighth century the Northmen reached the island and brought ruin and misery in their train. They first landed at Dublin, where they built a town which they made their headquarters, and during the next two centuries they established themselves everywhere along the bays and rivers that their long black ships could penetrate. They came in numbers great enough to build strong towns and make fortified settlements, and wherever they went they grievously oppressed the people. At length, toward the end of the tenth century, Brian Boroihme, or Boru, or Boruma, king of Munster, determined to put an end to the havoc that they continued to work. To this end he fought against and defeated Malachy, or Maelsechlainn, the high king, who had already himself defeated the Danes—the Malachy who "wore the collar of gold that he won from the proud invader." Then Brian made himself high king, and at the head of the largest armies that

FAMOUS SPOTS IN IRELAND

The basaltic columns of the Giant's Causeway in County Antrim.

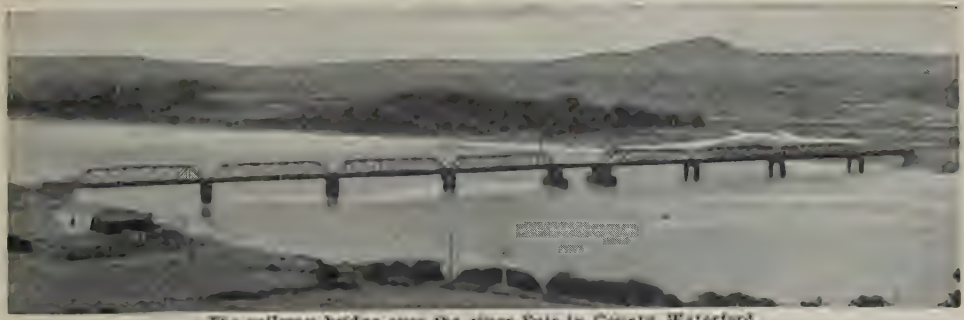
Lankagh Bridge, near Rosapenna, Donegal.

Dunluce Castle, near Portrush, Antrim.



Barnesmore Gap in the Donegal Hills.

Brickeen Bridge on the Killarney Lakes.



The railway bridge over the river Suir in County Waterford.

Photos, pages 2931, 2939, 2942, by Lawrence, Walker, Photocrom, Whelan, Cutter & Wrench.

he could muster, he defeated the Danes again and again, until he forced them to pay him tribute and to keep within their seaport towns.

For twelve years Brian seems to have been strong enough to give peace to the harassed land. Then one of the sub-kings of Leinster rose in rebellion, and the Danes took advantage of the opportunity that this fresh warfare gave them, for a last effort to gain supremacy in the island. Calling to their aid their friends from Northumbria, Anglesea and the Isle of Man, and from the islands of the Scottish coast and the Orkneys, they gathered a large host and prepared for battle at Dublin. On his side Brian had not been idle. With the men of Munster and Connaught at his back, and with the aid of his old enemy Malachy and the men of Meath, he marched to the fray. The two armies met at Clontarf, outside Dublin, on Good Friday of the year 1014. The battle raged all day, and victory remained with the Irish. But Brian's eldest son, Morrogh, and his grandson Thorlogh fell fighting, and Brian, who had remained in his tent to pray, was slain by the Danes as they fled. The battle put an end to the Danish power, but it also ended any hope of the people's becoming a united nation; for no ardri arose who was strong enough to keep peace for a sufficient length of time to accustom the people to a settled rule, and the history of the next hundred and fifty years is a story of constant quarreling between the kings.

How the Norman King of England Came to Ireland

In the twelfth century Dermod MacMurrough, king of Leinster, carried off Dvorgilla, the beautiful wife of O'Rourke, prince of Brephni, in Connaught. O'Rourke went for help to his overking, Roderick O'Connor, who was also ardri, and Dermod was forced to flee from the country. Burning with a wish for vengeance, he sought the aid of Henry II of England. Henry was too busy with his wars in France to take the matter up himself, but with his permission Dermod enlisted the aid of Richard Clare, Earl of Pembroke, known as Strongbow, Maurice Fitzgerald, and a number of other barons. As a reward for his help, Dermod promised that his daughter Eva should be the wife of Strongbow and that Strongbow should succeed him as king of Leinster. The next year the barons invaded the east and south of the country. Dermod was re-established in his kingdom, and the barons established themselves in the east, along the broad estuaries which run up into the heart of the country, and in the seaport towns. The Irish chiefs made a brave fight against the invaders, but were defeated almost everywhere, and when Henry II, fearing that his barons would become too powerful for him, went over with a large army, most of the chiefs as well as the barons did him homage and promised allegiance to him as their overlord.

English law went into force in the land that fell under the power of the barons, while in the part of the country that was ruled by the chiefs the old Irish law of the Brehons was kept. But as time went on, some of the barons, who wished to gain power as Irish chieftains, cast aside the English law and put themselves under the Brehon Laws. This, of course, was treason in the eyes of the king, and to prevent repetitions of the offense a law called the Statute of Kilkenny was passed in the reign of Edward III, which forbade intermarriage between the two peoples and declared it unlawful to wear Irish dress in English territory. The law had little effect, however, and gradually a large part of the country which had been English fell back under Irish rule, and many of the people of English descent became more Irish than the Irish. This was the state of affairs at the close of the Wars of the Roses, but now we come to another part of the story.

English Law Finally Enforced by Henry VIII

During the Wars of the Roses the power of the barons in England was broken. It was otherwise in Ireland. There, although chiefs and barons alike recognized the king of England as overlord, the chiefs really looked upon themselves as independent kings, and the barons had become as powerful as the great French nobles ever were. With the Tudors came a change. Their efforts to reduce the power of the chiefs and barons led to many wars and rebellions, during which the land was made desolate. But it is useless to attempt to tell the story of these ceaseless wars and their causes. It is enough to say that by the end of the reign of Elizabeth practically the whole island had been conquered.

In the sixth century St. Kevin, an Irish hermit, built himself a cell in the Valé of Glendalough, in the county of Wicklow. Students gathered round him, and a monastery grew up which became famous as a place of learning. The seven churches are scattered through the valley, but in an inclosure in the centre of the picture we can see the round tower and the ruins of the cathedral and St. Kevin's church.

This is a picture of the cathedral and part of the pretty town of Queenstown, which is so well known to us as a place of call for transatlantic steamers. The cathedral was begun only about the middle of last century and is still unfinished. Queenstown harbor is the harbor of the city of Cork, the most important city in the south of Ireland.

Photos, copyright, Underwood & Underwood.

Henry VIII put an end forever to the Brehon Laws and declared the English law in force throughout the island, and as he was strong enough to exact allegiance from the chiefs, the law was obeyed. He also divided part of the land into counties, and so began to break up the boundaries of the smaller kingdoms.

CROMWELL AND HIS IRONSIDES SWEEP THE LAND

In the reign of James I a colony of Scottish Presbyterians was brought over, and settled in the northeastern counties of Ulster in place of some of the Irish owners, whose lands were declared forfeited. These were the ancestors of the Ulstermen of whom we hear to-day.

THE CITY HALL IN BELFAST, WHERE THE NORTHERN PARLIAMENT SITS

James, who was always in need of money, also exacted large sums from landowners as the price of the right to keep their land. His example was followed by Charles I, and this and the tyranny of the Earl of Wentworth brought about a rebellion in 1641 which lasted throughout the Civil War in England. Those who were not in rebellion in the country were in favor of the king, and when Cromwell, after the execution of Charles, had established the new government firmly in England, he crossed over with his Ironsides and began a ruthless war against both royalists and rebels. Thousands were put to the sword, crops were destroyed, castles ruined, houses burned, and when it was all over, numbers were sent to the West Indies to work as bond servants. Many of the estates were confiscated and most of the people who had owned them were forced beyond the Shannon to live; while the land which was thus made vacant was granted to Cromwell's soldiers and others upon whom he could rely.

After the accession of Charles II much of this land was returned by what was called the Act of Settlement, but many of the new occupants were left in possession, and this created fresh discontent. Still, all might have gone well, and the country might have made the best of things and settled down in peace, if it had not been for the lack of wisdom shown by James II, who, because of his foolish acts, lost the throne of England and fled to France. The next year, however, he landed at Kinsale, in the south of Ireland, hoping that, with Ireland as a base, and with the help of an army from France, he might be able to drive William III out of England and make himself king again. The people of the south and east of Ireland rose in his favor. The people of the north rose against him. The gates of Londonderry were closed against his army, and a new war was begun.

THE WAR BETWEEN JAMES II AND WILLIAM III

Four things stand out in this war—the siege of Londonderry, which held out against an overwhelming force until, at the end of fifteen weeks, it was relieved; the battle of the Boyne, where James ran away and William was victorious; the battle of Aughrim, where the Irish army, under a French general named St. Roth, fought with splendid valor against

great odds, but was defeated; and the siege of Limerick, which is just as famous as the siege of Londonderry. To end the war King William's general in command offered to let the garrison march out, and, if they wished, to sail for France. This was agreed to, and all except about a thousand followed their general, Patrick Sarsfield, into exile. In the succeeding years many thousands of young men followed their example, and during the wars of the eighteenth century the "Wild Geese of Ireland," as the Irish soldiers were called, were famous on nearly every battlefield of Europe.

SACKVILLE STREET, OR O'CONNELL STREET, DUBLIN, SHOWING THE O'CONNELL MONUMENT

At the time when Henry VII was trying to break the power of the Irish nobles, a lord deputy named Poynings, whom he sent over, had a law passed by which only laws which had been submitted to the king and the Privy Council of England could be passed by the Irish parliament. At the time this law was passed only a very small part of the country was really affected by it, and it did curb the power of the barons. Later, however, it created injustice, and this was strongly felt as time went on. There were other causes of complaint about the parliament. For instance, the parliament was not elected for a stated number of years and came to an end only with the life of the sovereign. Still greater injustice arose from what is called the Penal Code, a series of laws enacted in the reign of William III after the war of which we have just been speaking. They were passed under the influence of the fear caused by the invasion of James II with a French army and by the intolerant laws made by a parliament which had been called by James. Under this Code, Catholics had no political or religious rights, and there were irritating laws about education. There have been misunderstandings between the people of England and Ireland, and mistakes have been made on both sides, but these laws, we must remember, were made by the Irish parliament.

THE UNION OF THE IRISH PARLIAMENT WITH THE ENGLISH PARLIAMENT

Late in the eighteenth century, chiefly through the work of Henry Flood, a law was passed which provided that parliament should be elected for eight years only. Flood's work was taken up by Henry Grattan, and through his influence an act was passed by the English par-

liament in 1782 which repealed the declaration of its right to control the Irish parliament, and the same year Poynings' Act was repealed. Then Grattan began to work for the repeal of the Penal Code; but beyond the passing of an act in 1793 which gave Catholics the right to vote, he was unsuccessful.

The Irish parliament remained independent for eighteen years, but in 1798 some of the people rose in rebellion. The rebellion was put down, and after it was over, William Pitt, who was then prime minister of England, thought that it would be a good thing if a union of the two parliaments were made. In spite of opposition, his proposal was carried out, and the union was made in the year 1800 by a law passed by the Irish parliament, which enacted that Irish members should sit in the British House of Commons and Irish peers in the House of Lords at Westminster.

At the time of the Union, Pitt promised that the Penal Code should be repealed; but George III would not listen to such a proposal. The question was dropped at that time, but through the work of Daniel O'Connell all these unjust laws were repealed in 1829. Daniel O'Connell also began to work for repeal of the Union, and the agitation for repeal, which later on got the name of agitation for home rule, continued until in 1921 Southern Ireland became the Irish Free State.

THE CAUSES OF THE GREAT FAMINE OF 1847

As we have learned in reading English and American history, a belief was long held that colonies existed chiefly to supply raw material for the use of the mother country and that therefore the commerce or manufactures of a colony which interfered with the commerce or manufactures of the mother country should be repressed. Of course we know now that such a belief is quite wrong, but at least until the end of the eighteenth century it was honestly held by almost everyone. Its grave injustice was seen by only a few until after it had led to the American Revolution. Poynings' Law gave color to the belief that Ireland was a colony. It was thought that her cattle trade and woolen manufacture interfered with English trade and manufactures. Therefore, both were repressed, and except for the linen manufactures in the north, there was practically no industry left for the people except the cultivation of the land.

In the middle of the nineteenth century there were over eight million and a quarter people living in Ireland, and nearly eight million of this number were attempting to live on the produce of the land. This was much too great a number for a country the size of Ireland to support, even if every acre were fit for cultivation, and in Ireland there are large tracts of bogs and barren land, and tracts of mountain country. In such a case as this the failure of even one crop is sure to bring a catastrophe, and such a catastrophe happened in Ireland.

In the year 1847 the potato crop, upon which the poorer people in the country had learned to depend largely for food, was killed by a mysterious blight. The consequence was a dreadful famine. It was followed by sickness, which the people, weakened by hunger, could not resist, and hundreds of thousands died. This was the beginning of a great emigration to the United States and the British overseas dominions, and within fifty years the population was reduced to about one-half.

THE BEGINNING OF THE LAND QUESTION IN IRELAND

About thirty-five years after the famine of 1847 a new leader arose, named Charles Stewart Parnell, under whose guidance disputes about the possession of the land began. To understand their cause we must go back a little way in the history of Ireland.

In the sixteenth and seventeenth centuries large estates which were confiscated in the wars were granted to Englishmen or to Irishmen who were loyal to the king, while large tracts of land remained in possession of the descendants of some of the ancient chieftains and of the great Anglo-Norman barons. Thus, much of the land belonged to members of a few families. Naturally these large estates could not be cultivated by their owners, so they were rented to tenants. Most of these tenants were very poor, partly because the methods of cultivation were too primitive to make the land productive and partly because the rents were, as a general rule, too high, especially after cheap grain imported from America reduced the price of grain raised in Ireland.

IN AND NEAR LIMERICK

The wall and towers shown here are part of a Norman castle known as King John's Castle, which was built in the time of King John to hold the bridge across the Shannon at Limerick. The bridge, which is modern, is called Thomond Bridge, in memory of the old kingdom of Thomond, in Munster. The conveyance which you can see crossing the bridge is known as a side car, and is peculiar to Ireland.

Peat, which is much used for fuel by the country people in Ireland, is cut in bricks and piled in loose heaps to dry. Cutting peat is not always such easy work as the picture shows, for there is a great deal of water in many bogs. Trenches are dug to drain them, but the task of getting out the peat is very disagreeable. Machinery is now sometimes used to cut the bricks of peat, and heat is used to dry it.

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Some of the Reasons for Conflict

Life was not easy for people who had large farms, and for the men who had farms of only a few acres it was very hard. But there was little by which any money at all could be made except farming. There was a constant struggle to obtain farms, and as long as men could be found who were willing to attempt to pay high rents, few landowners were willing to lower them. When crops failed and prices went down, and farmers were unable to pay their rents, some landlords said farming did not pay, and instead of letting all their land for agriculture, turned the little farms into large fields for pasture. The landlords, of course, thought they had a right to do as they would with the land, because it was theirs, just as they thought they were right to charge as much rent as they could get.

On the other hand, a feeling had come down from the time of the Brehon Laws that the land belonged to the people. Small farmers found it hard to get food for their families in bad seasons, and after a time men who could not pay the high rents to which they had agreed, or whose rents had been raised, began to refuse to pay any rent at all. They were helped in their refusal by a society called the Land League, which was organized about the time that Charles Stewart Parnell became the leader of the majority of the Irish members in the House of Commons. He did not organize the society, but he gave it his support, and its members kept him at the head of the Irish party almost until his death. The Land League obtained a strong hold over Ireland during the years it was in existence, and had a great deal of influence on the country. Many people thought its influence was all good, many thought it all bad. It is quite true that some of its members used it as a cloak for deeds of which others were ashamed, but it made Irishmen begin to think they had a country to be lived in, not a place to run away from as soon as they were grown up.

Until Parnell gained the leadership, the majority of the Irish members of Parliament had belonged to one or other of the great political parties. Parnell formed them into an Irish party, to follow his lead in all questions, and this gave the Irish members much more power in Parliament than they had had when they were divided.

The Farmers Become Owners of the Land

Meantime great efforts were being made to do away with the misunderstandings between the English and the Irish people, to help the country toward prosperity, and to end strife. It was thought that because Irishmen had so much love for the land, it would be better if the land belonged to the people who actually worked it, so laws were made by which the government was given power to lend money to tenants wishing to buy their farms, whether the owner of an estate wished to sell or not. Many people took advantage of these laws, and much of the land is now owned by the men who cultivate it. In addition, a commission was appointed to fix rents where the tenants thought them unfair.

Of late years Ireland has become much more prosperous than it had ever been. Co-operative societies have been organized to enable farmers to help one another in buying and in finding good markets for their produce; more agricultural schools have been established; creameries have been built; and, particularly in the west, schools have been established to teach cottage industries.

In 1914 a Home Rule bill was passed. The province of Ulster objected to home rule, however, and threatened to fight if the Act of Union were repealed. Just then the World War broke out, and in the face of the common danger the question of home rule was postponed. But as the war went on some of the people became impatient. They listened to the speeches of men who told them they were being unjustly treated, and in 1916 a society called the Sinn Fein made an attempt at rebellion.

The Uprising on Easter Monday, 1916

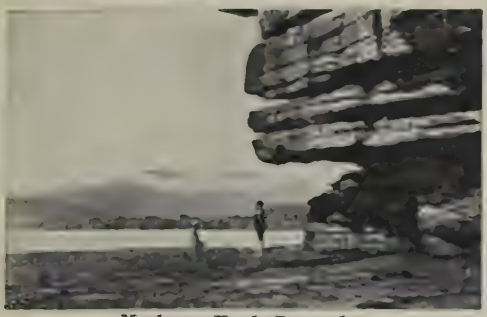
On Easter Monday, 1916, a force of the Irish Volunteers and Citizens Army, all Sinn Feiners, attacked the Post Office and other public buildings. They posted announcements that Ireland had become a republic. After hard fighting in the streets, and after fires had ruined several sections of the city, the Republicans were defeated and most of them captured. Many men and women were arrested and held in English prisons on charge of

BEAUTIFUL SCENES IN IRISH WATERS

The sheltered haven of Killybegs in Donegal Bay.

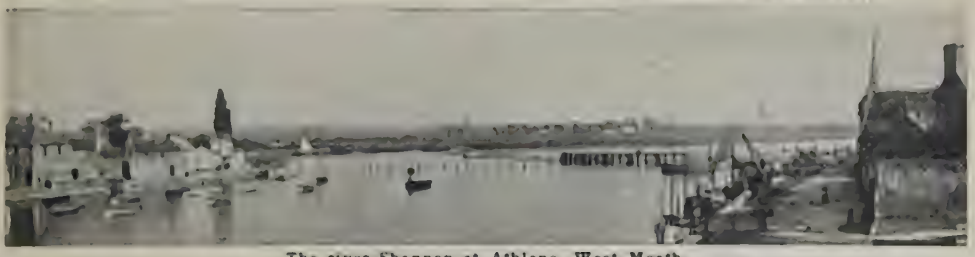
An ivied bridge near Antrim Castle.

The Meeting of the Waters, Killarney.



Muckross Head, Donegal.

Colleen Bawn Rocks, Killarney



The river Shannon at Athlone, West Meath.

treason. Fifteen of these were sentenced to death and were executed. The effect of these deaths was to redouble the activity of the Sinn Feiners and to excite the people of Southern Ireland still more. At the same time the resolve of Ulster to stick to the British Empire was considered by the Sinn Feiners an additional provocation. Ireland became more and more divided in itself.

Eamon de Valera, the son of a Spanish father and an Irish mother, was the recognized leader of the Sinn Feiners. He was a fiery and impetuous leader, whose followers were actuated by a bitter hatred of England. He believed in extreme measures. On the other hand, John Redmond, who loved Ireland too, was inclined to move slowly and deliberately. His followers were not as urgent nor unyielding in their actions and demands. John Redmond, however, died in 1918.

The different parties in Ireland in 1916

To understand what happened in Ireland after 1918, it must be remembered that the Irish people were divided into three parties, each with a different ambition. The Sinn Feiners, led by De Valera, wanted the whole of Ireland to be a republic, separated entirely from the British Empire. The Nationalists, under John Dillon, wanted Ireland to have home rule similar to that enjoyed by Canada. The Ulsterites, led by Sir Edward Carson and later by Sir James Craig, wanted to be governed by England. A general election at the end of 1918 brought the Sinn Feiners into power. They refused to go to London, but met in Dublin, and their first parliament, called in Irish "Dail Eireann," chose De Valera as president.

This was a bold move because there was already a government—the British Government. But for a while the Dail Eireann was regarded by Sinn Feiners as the real ruling power. Then began a period of terror throughout the country. Murders and outrages of all kinds became common. Some were committed by Sinn Feiners, and some by the soldiery and police. Men were shot from behind hedges by cowardly assassins. Early in 1920 the Republicans organized a campaign with the result that there was scarce a house in Ireland in which an ordinary citizen felt safe. The Sinn Feiners claimed that this step was necessary to free the country from British rule. But finally the British Government sent in more soldiers and checked the movement. In December, 1920, Sinn Fein again won the election, and fighting commenced again.

The Irish Free State comes into being

By a new act of the British Parliament there were now to be two parliaments in Ireland, one in Belfast, the other in Dublin. Sir James Craig was president of the former. The Ulster parliament was opened by King George in person in June, 1921, but the rest of Ireland refused to hold an election. Months of arguments and conferences between the British Government and Sinn Fein representatives ended in a treaty signed December 6, 1921. By this treaty Southern Ireland, with the name of the Irish Free State, became a partner in the British Empire, with the same rank and powers enjoyed by the dominions. De Valera and some of his followers would not accept this treaty, and Michael Collins became acting premier. For months there was constant fighting between the supporters of the Free State and those of De Valera. Michael Collins was killed, and was succeeded by William T. Cosgrave. Gradually the Free State Government secured control of the country.

The Irish Free State officially took its place among its sister dominions on December 6, 1922, when the permanent parliament met. A well-known Irishman, Timothy M. Healy, was appointed governor-general. William T. Cosgrave was chosen president of the Executive Council. In September of the following year the Irish Free State was admitted to membership in the League of Nations. De Valera, who still called himself president of the Irish "Republic," went into hiding, but worked against the Free State. He was arrested in August, 1923, but escaped for a time. After his escape, however, he did not regain wide support from his former followers. It seemed as if all Irishmen were weary of fighting. Those at the head of the government are bending all their energies to making the Irish Free State a success, and a prosperous and happy future may be in store for Erin.

THE NEXT STORY OF ALL COUNTRIES IS ON PAGE 3047.

IRISH ART A THOUSAND YEARS AGO

An ancient brooch from Tara, home of Irish kings.

A very old book cover carved in bronze.

The 800-year-old Cross of Cong, in Mayo County.

A page from the Book of Kells.

Shrine of St. Patrick's Bell.

A wonderful book cover 1,000 years old.

The beautifully carved Chalice of Ardagh.

The Shrine of St. Patrick's Tooth.

ANCIENT ABBEYS, TOWERS AND STRONGHOLDS

The Round Tower of Clondalkin.

The Norman Baptistery of Mellifont Abbey.

The graceful Round Tower of Ardmore.

The ancient city of Cashel, in Tipperary.

The Boyle Abbey, Roscommon.

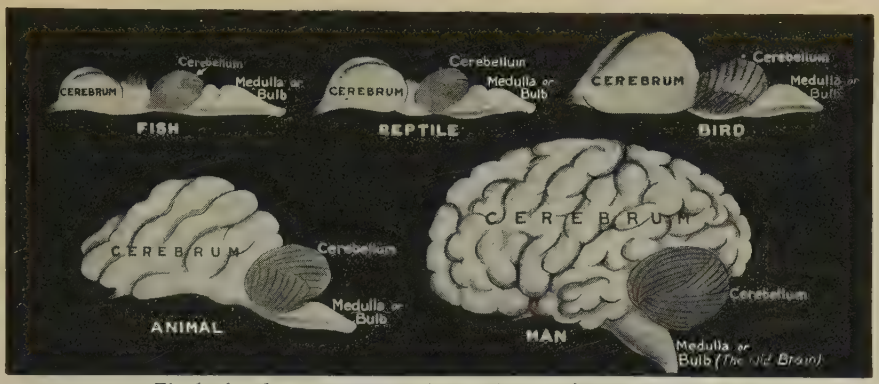
The ruined walls of Quin Abbey.

The Hill Fortress of Grianan.

St. Columba's Cross at Kells, Meath.

A sculptured coffin lid from Kells.

Monasterboice Cross, County Louth.



The brain of man compared with the brains of other creatures.

THE MYSTERY OF THE BRAIN

CONTINUED FROM 2841

THE most important part of the nervous system of a human being, as we have seen, is what may be called the new brain. It is so large, and has grown out so far in all directions, that the whole of the older part of the nervous system is hidden under it. Ordinarily when we talk about a man's brain it is entirely of this new brain that we are thinking. The proper name for it is *cerebrum*.

Our first glance at the cerebrum shows us that it is a double organ. It has a right half and a left half. These two are like each other, though it seems that in right-handed people the left half, and in left-handed people the right half, is slightly larger. We have therefore, in a sense, two brains, as we have two arms; for our bodies are built on the principle of two halves corresponding to each other.

If we separate slightly the two halves of the cerebrum and look down between them, we see a mass of white nervous tissue running across from one side to the other. This is a bridge between the two halves of the brain by which they are made to work and act as one. When we look at the surface of the brain we see at once that it is very much folded. All over it the surface has been turned inward into deep valleys. These vary in depth and length, but on the whole they form a definite pattern which is the same on both sides of the brain, and its main lines are the same in all human beings. All the folds and the spaces between them have special names. The use of the folding is that it permits what is really the surface of the brain to be increased enormously without taking up more room. Now the surface of the brain is the all-important part. Brains have been growing bigger in the animal world for ages past. This means that there has been a great deal more room required to house the brain in. Therefore skulls have been getting larger. The size of the skull, compared with the size of the body, is simply gigantic.

But this is not all. The brain has grown more quickly than the skull, and the surface has been deeply tucked in here and there, as it went on growing. Now, there is as much, or perhaps more, of the surface of the brain tucked away than shows on the outside. Generally, the higher the type of brain, the more its surface is folded. We can show this by tracing the brain in different animals or by comparing one human brain with another. As animals have become more and more intelligent, and have trusted more to brain and skill than to size and

strength, the surface of the brain has become more folded. People who study the subject can tell in a moment by looking at the surface of the brain alone whether it belongs to one of the older kinds of animals or to one of the intelligent animals.

THE MANY FOLDS IN THE BRAINS OF VERY INTELLIGENT MEN

Many brains of famous men have been examined. Generally they are found to be highly folded. The contrast is very great between them and the brains of such a humble type of mankind as the Bushman of South Africa. This means, of course, that if we could unfold all the brains in question and stretch out their surfaces quite flat, the cleverest brains would be those with the biggest surfaces.

The size of the skull, its shape and the humps on it, can tell us absolutely nothing as to how much the brain is folded. Nor can it tell us what we shall find when we examine what the foldings are made of. There is, in a rough way, some correspondence between the size of the skull and the size of the brain inside it, but skulls vary in thickness. No one can possibly tell what it is that is making up the size of the brain. Even if all skulls were the same thickness, and even if bumps corresponded to the brain (which they never do), the brain inside might be large because certain spaces inside it were swollen with fluid. It might be large but with a comparatively smooth surface. It is quite easy to understand that a well-packed brain, which will go into a smaller skull than another, may yet, if unfolded, have a far greater surface.

THE MOST MARVELOUS THING THAT ANY MAN KNOWS

About a hundred years ago practically nothing was really known about the brain. Then men thought that by feeling and measuring the skull they could learn about the brain, and so tell the character of the person to whom it belonged. Our modern knowledge of the brain has taught us that it is hopeless to expect this, simply because the things that matter do not affect the skull at all.

We must understand why it is that the surface of the brain matters so much. When we cut through the cerebrum of any of the higher animals we find that it consists of an outside layer which is gray and an inside layer which is white. This gray layer, which covers the entire brain, always dips down and up again wherever the brain is folded. There would be no meaning in the folds if it did not. It is often called the *mantle*.

We always find this wonderful mantle. It is the real brain, and, as we find it in mankind, it is the most wonderful thing of which we have any knowledge. It owes its gray color and all its meaning and wonder to the fact that it is principally made up, not of nerve-fibres, but of nerve-cells. The rest of the brain is made up of nerve-fibres or nerves. These give it a white appearance, like that of an ordinary nerve in the arm or the leg. The gray mantle contains comparatively few nerve-fibres, which connect its different parts to some degree.

THE BRAIN MADE UP OF THOUSANDS OF MILLIONS OF CELLS

What really makes up the gray mantle is a mass of thousands of millions of nerve-cells. They are more wonderful even than those we find in the spinal cord, or those which live in the bulb and control our breathing, for they have to do with thinking, not to mention seeing and hearing, and so on. We find about five layers of cells in any part of the gray mantle that we examine, but we also find that the cells differ in different parts of the brain. Also, if we examine corresponding parts of the brain in large numbers of animals of quite different kinds we find that the same arrangement of cells occurs in corresponding places.

We can take a microscope slide containing a large number of cells shaped like pyramids and arranged in a certain way, and show it to a man who has studied the brain. He might not be sure what animal the brain had belonged to, but he could say in a moment that that was the part of the brain which the animal used when it wished to move its muscles.

Again, if he saw certain curious groups of cells lying not very far from the surface of the brain, he would say, without hesitation: "That comes from the part of the brain the animal smelt with." No one has any idea what this particular group of nerve-cells has to do with smelling, but we always find them in the smell part of the brain, but nowhere else.

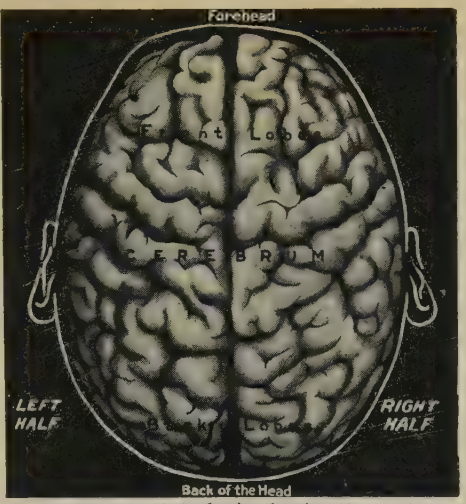
The parts of the brain which have to do with sight and hearing are just as definite in their structure. It is vastly

easier to tell that we are looking at something taken from the vision part of the brain than to tell what animal it was taken from.

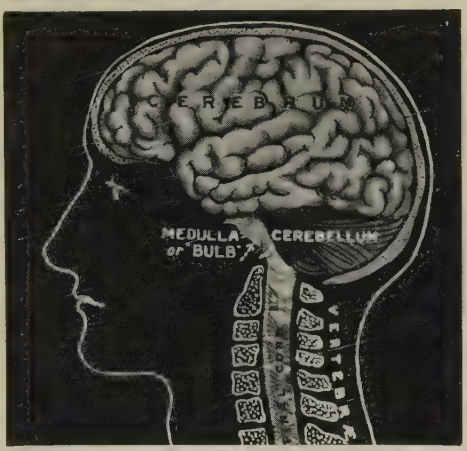
The whole of the surface of the brain has been mapped out. When we have carefully learned to map out the various brain centres for the motion of muscles, for feeling, sight, hearing, taste and smell, we find that still the greater part of the whole surface of the brain is actually untouched. It is almost as if the greater part of the surface of the brain had no duties.

Now, when we begin to examine the brains of other animals, it soon becomes possible to take, shall we say, twenty different brains and arrange them in an ascending order. We begin with the brain of some simple kind of animal and end with the brain of man. If we do this we find a wonderful thing. It is that the lower we go down, the nearer together in the brain are the different centres we have already found in the brain of man.

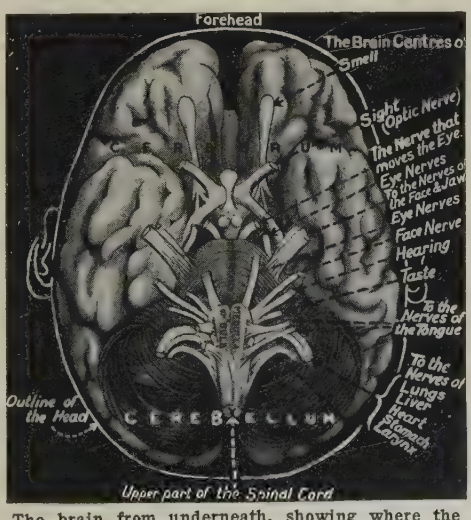
Indeed, when we go low enough, the whole brain practically consists of these various centres—for motion, for seeing, and so on—all lying next



Here is the top of the brain showing the cerebrum.



Proportion of the skull occupied by the brain.



The brain from underneath, showing where the various nerves enter the brain.

to one another. They make the brain. But as brains get bigger what happens is, not that these centres get bigger, but that they become gradually separated from one another by the growth of new parts of the brain between the old centres. The process goes on and on, until at last in mankind—and only in mankind—it has reached the stage at which the various special centres have become mere patches that lie here and there on the surface of man's huge brain.

What, then, is the meaning of these great new areas that have come into existence, to which the growth in the size of the brain is really due? We shall surely learn something of them if we trace the course of the nerve-fibres that run out from the nerve-cells in these areas.

We find that the fibres from the cells in the special centres run just where we should expect. The fibres from the seeing centre run straight to the eye; the fibres from the hearing centre are connected with the ear; the fibres from the centre for movement run down into the spinal cord and are connected with the nerves that go to the muscles.

These facts, of course, help to give us the key to the duties of these centres. If we can find where the nerves run from the newer areas—frequently called the "silent areas"—we shall guess what these areas do. It must be something very important, because it seems to explain the real difference between intelligent animals and stupid ones, high ones and low ones.

We find, then, that these fibres from the silent areas run in every direction. They run in definite groups and by definite ways to the other centres of the brain. What they do is to *associate* one part of the brain with another. Soon we shall study the way in which we act, the way in which we put two and two together, the way in which one thing makes us think of another. Then we shall begin to understand how it is that the *association fibres* make all the difference in the world between a high brain and a low brain.

THE VAST DIFFERENCE BETWEEN A MAN'S BRAIN AND AN ANIMAL'S

If we compare the spinal cord or the bulb of a dog with that of a man, there is not much to choose between them. If we compare the new brain of a dog with that of a man, we find that the difference consists mainly in association fibres and cells. If we compare the vision centre of a dog with that of a man, we find the two in the same part of the brain in each case, and with the same special type of cell.

The difference, however, is that the gray mantle in the case of man is much thicker. When we come to inquire what makes it thicker we find that it contains a greater number of association fibres. Generally we may say that the differences between a high brain and a low brain are: that in the special centres the gray mantle is thicker in the high brain, because it is crammed with association cells; and that in the high brain the special centres are forced apart by the growth between them of new parts of the brain which bring all parts of the brain into connection with one another.

There are one or two very interesting exceptions to this rule, and they have a meaning. It must have struck all of us, if we ever think of our senses, that some of them are more noble than others. We agree that it is a more dignified thing to enjoy a picture than to enjoy a chocolate. When we suppose that vision and hearing are more noble than taste and smell we are quite right. The reason is that they are more human. They reach a higher development in us than in any other creature. So far as smell is concerned, it is probable that our brains are far inferior to those of almost any other creature that has a brain at all.

THE SENSE OF SMELL IS WEAK IN MAN AND STRONG IN ANIMALS

If we study the smell part of the brain in different animals, we find that smell reached its perfection ages ago. But a sense of vision is far finer than smell. Not only does it act at very great distances, but it gives us a thousand times more information than smell can.

Part of the history of progress in the world of life has been that sight has improved and largely taken the place of smell. This is most marked in ourselves. The dog is a very high kind of animal, belonging to an order which ranks next to the monkeys. We all know how splendid the dog's sense of smell may be. But in our own brains the part which corresponds to smell has shrunk. It is, indeed, so small that it took a very long time to find where it was; while the vision part of the brain has become huge.

The great growth of the back of the brain in man is due to the importance of vision. We see with the extreme back part of the cerebrum on both sides. Our real eyes are at the back of our heads. We have already been told that the cerebellum is very large in us. This is true, but the vision part of the cerebrum has grown even more. The cerebellum is completely hidden from our sight by the cerebrum, when we look down on the brain from above.

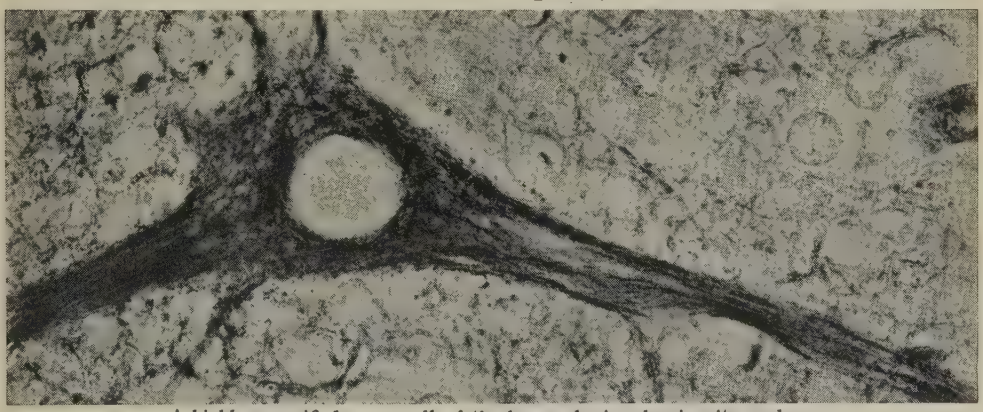
THE DIFFERENCE BETWEEN ONE KIND OF SENSE AND ANOTHER

It might be supposed that there is something wrong here, because many animals, such as birds of prey, have far keener sight than man has. But are we right in supposing that the mere keenness of a sense is the highest thing about it? Not at all. The point is the extent to which we can use the information that sight gives us and the way it is linked up with every other part of our minds. The vulture can see a speck in the desert at a tremendous distance, but will the vulture enjoy a noble scene? When we ask questions like this we see at once what it is that really makes a sense high. No known animal has in the vision centre of

its brain anything like the depth and variety of structure that we have in ours. This is the great fact for us to remember about the place where the seeing is done. We have seen that smell and taste are not very important in man, and it might be supposed that the sense of touch would not be greatly developed in man. That would be a very great error, however. The most intelligent of all birds is the parrot. We notice this not only from its power of imitating sounds, but in many other ways. It is an interesting fact that the parrot has a more delicate sense of touch than any other bird. It has quite a good notion of using its claws as fingers. It has the idea of stroking and feeling what a thing is like.

It is not just a chance that the most intelligent bird is the bird with the best sense of touch. It is what we should expect. The sense of touch is the mother of all the senses, in a way. Education of the sense of touch is one of the foundations of all good education. There is nothing we notice more positively about an intelligent child than that it loves using its fingers. Whatever happens, the healthy child must constantly use its sense of touch. We find that the touch part of the human brain is highly developed. It is the delicacy and variety of our sense of touch, and the marvelous way in which this sense is connected with all our other senses, that accounts for our skill. This is one of the most wonderful things about us as compared with other creatures. Not in a thousand years could any other creature but man be taught to read with the fingers, even if the creature had a brain that could understand. A distinguished naturalist has said that he believes that an elephant might be taught to read. He does not suggest, however, that a blind elephant might be taught.

For a long time it was a great puzzle to find the touch centre in man's brain. It lay, we may truly say, under our very eyes; but we never thought of looking for it there! A very large area of the gray mantle on each side of the brain is the centre for voluntary movement, and it is here that the will of man gives its orders. For many years we knew this, and called it the motor centre. When we were looking for the centre of the touch sense we never thought of looking there. But now we have found that the centre for will and movement is the centre for touch. The two lie mixed up together, and the connection between them is the closest of all connections in the nervous system.



A highly magnified nerve-cell of the human brain, showing its nucleus.

The sense of hearing lives low down on the side of the brain. As we all know, this sense has led to the possibility of music and all that that means. The hearing centre of the brain is very large in mankind, and when we examine the cells in it we find a state of things that exactly compares with what we found in the case of vision. It may be that some animals can hear sounds so slight that we cannot hear them, but that is not the test. No animal knows the difference between good music and bad. Much less could any animal create a piece of music. It even appears that there is a special part of the hearing centre, lying rather toward the front, which is concerned with music as distinguished from ordinary sounds, though we do not know very much about this yet.

THE NEXT STORY OF OUR OWN LIFE IS ON PAGE 3059.

SCENES IN THE PROVINCE OF QUEBEC

This house, situated on the Saguenay Bay, is inhabited by Canadians of French descent, called habitants. The walls are old, but some features show modern improvements. Rail fences, such as those shown here, which were once universally used in both the United States and Canada, are still common.

Photo, British and Colonial Press.

Old Quebec was built along the St. Lawrence in the shelter of the higher ground on which the fortress was built. The wholesale district is now there, but many of the poorer people still live down near the river. The public buildings, better residences and great hotels are on the higher ground. Perhaps because of the contrast Quebec seems more French in spirit than it used to be.

A ferry in Quebec.

THE FRENCH IN CANADA

A TRAVELER through the province of Quebec cannot fail to notice that he is passing through a country of French civilization. Though the French flag is seldom seen except on some holiday in company with others, nevertheless on this part of the continent where France once ruled supreme she has been able to leave a permanent impress. The picturesque banks of the St. Lawrence from the Atlantic to the great lakes of the West are the home of a large and rapidly increasing population whose language and customs are so many memorials of the old régime.

THE ORIGINAL IMMIGRANTS FEW IN NUMBER

It is estimated that not more than 8,000 immigrants came from France during the French régime. Many of these were ruined gentlemen and half-pay officers. Louis XIV boasted that Canada contained more of his old nobility than all the rest of the French colonies put together. At the time of the English conquest this little band had grown to 65,000. Since 1763 the natural increase of French Canadians has been little less than miraculous. This group has increased, until to-day Canada has upward of two million Canadians of French descent, and nearly another million have gone to the United States.

In different parts of Quebec and Ontario the French Canadians are gradually replacing the English-speaking people. Twenty years ago eleven counties in the south-eastern part of the province of Quebec had a majority of English inhabitants; to-day the majority in each case is French. The movement is so considerable that in numerous townships where not many years ago not a word of French was spoken, you would hardly be understood to-day if you spoke English. The city of Sherbrooke, with a population of 9,000 in 1901, had a slight English majority; in 1911, out of a population of 17,000 there were 11,000 of French origin; in 1921, out of a total of 23,500 there were 16,700 French. The farmers of English, Irish and Scotch descent have gone in great numbers to the West, and their farms have been bought by the French Canadians.

The French Canadians have, during the past few years, made many settlements in Ontario. They have invaded the province from three points—the east, the southwest and the north. When the last census was taken there

were nearly 250,000 in the province, and they are increasing so rapidly that a few years ago a Toronto newspaper said that in twenty-five years French Canadians would form at least a fifth, if not a quarter, of the population. They have representatives in the Ontario assembly and in the Dominion Parliament. The Ontario farmer of English descent is moving westward, and his place is being taken by the French Canadian. In the county of Glengary, where fifty years ago there was a community solidly Scotch- and Gaelic-speaking, the French now compose at least half of the population. An increasing number is employed in factories and in mills. In the Maritime Provinces over 150,000 more are found. This increase is small compared with that of Quebec and Ontario. The Canadian West does not show large French gains. There are a few centres, but the increase in numbers has not been great. The French Canadians are contented to confine themselves to the older provinces.

The French Language Still Persists

Outside of the large cities the French language is the only one spoken in Quebec. The habitants speak the old dialect of Brittany and Normandy, with a mixture of English, but the educated classes speak excellent French. The better classes of French Canadians take pride in studying the language of the country of their ancestors, and they have an interest in studying the history of their own race in Canada, and especially in Quebec, that puts to shame the ignorance and heedlessness of the past which so often characterizes the Canadian of British origin. The records and the statutes of the Dominion Parliament are always given in the two languages, and the same is true of all the motions put by the Speaker. Though the reports of the debates appear daily in French, English prevails in the House of Commons and in the Senate. The French Canadians in the parliament at Ottawa are all, by necessities of the case, bilingual, and it is some evidence of the culture of their leading public men that many among them are able to express themselves in English with a freedom and elegance which few English-speaking members can pretend to equal in French. In the legislature of the province of Quebec, French has almost excluded English, though the records are given in the two languages. In the supreme court of the Dominion the arguments may be in French, and the two Quebec judges give their decisions in their own tongue.

Their Fondness for Poetry and Music

French Canadians have a natural love of poetry and music. Madame Albani, a French Canadian by birth and education, won great distinction as a singer. It cannot be claimed, however, that any writer of this nationality has as yet produced an opera or a drama of any special merit. There is an obvious reason for this. The Church has opposed the theatre, which has never attained a successful foothold in Quebec. Sacred music, so essential a feature of the Catholic service, has always been cultivated with success.

During the past half century the French Canadians have created for themselves a literature which shows that they have inherited much of the brilliancy of their race. Their histories and poems have attracted much attention in literary circles in France, and one poet, Louis Frechette, won the highest prize of the French Institute for the best poem of the year. In art, progress has been made, and men go to the Paris art schools from time to time. The best-known Canadian sculptor, whose monuments of eminent Canadians stand in several public places, was Louis Hébert, a French Canadian, of whom we read in the chapter on Canadian Sculpture.

In the study of constitutional history the French Canadian lawyers have a living and profound interest. With the logical faculty of their race they trace issues back to first principles. The result is that in the sphere of law they have produced many men whose rank is high indeed. This seriousness of intellectual interest, joined to an eloquence, natural in many but strengthened by practice and study, gives them a notable place in the courts. The interest in science has not been cultivated with the same care. Laval University, their principal educational institution, lays its main stress on religious and philosophical and literary studies, and it has now been reinforced by the French University of Montreal, which gives the main weight to medicine and law.

The people are devout Catholics. The numerous churches, colleges and convents

of the country show the power and wealth of the Church and the desire of the people to glorify and perpetuate it by every means in their power. Jesuits, Sulpicians and Recollets have done much to mold the thought and control the destiny of the people.

EDUCATION AMONG THE FRENCH IS UNDER CONTROL OF THE CHURCH

The public education of the French Canadians in the province of Quebec is entirely in the hands of the Catholic clergy, and that of the Protestant minority in the hands of a Board of Protestant Commissioners. The taxpayer has the option of saying whether his taxes shall be spent for Catholic or Protestant educational purposes. The priests exert a powerful influence and guard very carefully what shall be taught in the schools under their care and what books shall be read by the people. The educated classes are more independent. The people in the rural districts obey every order from the Church, and among them the clergy exert their greatest influence. Only the French language is taught in the schools, and in the large majority of the country parishes one would not be understood if the English language were used.

DISTINCTIVE QUALITIES OF THE FRENCH CANADIANS

No class of the population of Canada is more orderly or less disposed to crime than the French Canadian. The standard of morality is high. During the rule of France the king made a gift of twenty livres to each young man who married before the age of twenty and to each young girl married before sixteen. The custom of early marriage is still very common, and large families are the rule in all parts of Quebec. True riches for the habitant is a house full of children, and the result is that, though the race does not, generally speaking, make a great deal of money, it has more than its share of happiness and laughter. The family life is simple and wholesome. Some years ago the government of Quebec granted one hundred acres of land to every man who was the father of twelve living children. In less than a year over three thousand persons claimed and received this privilege. Intermarriages between English Protestants and French Catholics are rare. As a result there is little prospect of an Anglo-French race.

England has shown a broad-minded policy in dealing with the French Canadians, a race different from her own and different also in language, religion and traditions. When, in 1763, the country was taken from France, the English Government promised that the people should have freedom to practice their own religion, to use their own language and to follow their own customs. This promise England has faithfully kept. She has allowed them to dwell under the folds of her flag as a nation within a nation, and has permitted them to preserve the things which were dear to them. The French acknowledge this and admit that they have been as free under the dominion of the British Empire as they ever could have been under French rule.

The French Canadians are proud of their religion, their laws and their language. To them, however, Canada is all in all, and their Canada is French Canada. Modern France is to them a distant relation. England is a stepmother, but a venerable one.

Until lately the French Canadians have been much wrapped up with the traditions of the past. A new movement, however, has begun to show itself. They have commenced to pay less regard for the past and to live for the future. They are entering the industrial, commercial and financial fields with great success, and are found in every sphere of business.

The fact that the French Canadians have kept their distinctiveness, both during the long years that elapsed after emigration from France had ceased, and from 1759, when they became a conquered people, shows how much virility and vitality the stock possesses. As these two great races, the British and the French, have to live side by side in Canada, it is necessary that the utmost should be done to maintain mutual understanding. Each race has its great, but different, qualities. Prejudice and passion, as the history of Canada shows, are easily aroused. Sympathy is needed if true unity is to be maintained, and the greatest aid to sympathy is the power to understand what the other man says and to answer him in his own tongue. So, if you ever think that your French lesson is a bore, remember that it may, more than any other study, help you to be a useful citizen of Canada, the future of which depends on the working of every element of the population toward a common end.

THE CANADIAN HABITANT

THE old French system of government divided the country into large estates or seigniories. The owner of an estate was called a seignior and on accession to his lands was required to pay homage to his feudal superior. The seignior divided his estate among his vassals on condition of their making small annual payments in money or in produce. The vassals were also obliged to grind their corn at the seignior's mill, to bake their bread in the seignior's oven, to give their lord a tithe of the fish caught in their waters, and to comply with a few other conditions at no time heavy or strictly enforced. Many of these customs endured until within a very short time before the confederation of the provinces.

© E. S. Watson.
Gathering in the Hay, Ste. Famille, Isle of Orleans.

HOW THE NAME HABITANT AROSE

These original tillers of the soil would not accept the French name "censitaire," which carried with it some sense of the feudal servitude of the vassal in France. They preferred to be called "habitants," the French name for inhabitants, or free men, and not vassals. The name obtained official recognition in New France, and has become the characteristic name of the French Canadian farmer among English-speaking people. So the very name which strangers to the province of Quebec sometimes regard as a term of reproach is really one of dignity.

The habitant may be regarded as the original type of Quebec in very much the same manner as the people of Ontario claim the United Empire Loyalists as their original type. For the first hundred and fifty years of the history of Quebec the only white inhabitants were of French birth or extraction. When France ceased to take an interest in the colonists they were left quite alone. They were not touched by the movements of thought in Europe, nor were they affected by the French Revolution. They lived their own lives and developed their own persistent type of character.

It was their religion that kept them from deteriorating in their loneliness, and it is not to be wondered at that they are to-day devoted to their church. From the beginning the value of good neighbors was understood. In the newly settled districts a little group built their houses close together; the priest was with them; and their frugal and contented hearts made them independent of many things which young people to-day think they must have if they are to be happy.

The habitant is thus at home in Canada as hardly any other element in the population is. He is Canadian, not French. His mother country has moved away from him in thought and to no small extent in religion, but he stays, in his farm, in his methods, and in his religion, just as his great-grandfather stayed.

The attachment of the habitant to the land is very striking. In many instances farm lands are still held by the direct descendants of those to whom they were granted in the earliest days of the colony.

The tourist who travels through the province of Quebec sees on all sides the evidence that he is passing through a country of French origin. Here and there he sees houses and churches which remind him of many a hamlet or town that he has visited in Brittany or Normandy. Many of the barns and outhouses have thatched roofs which are not seen in any other part of Canada. The houses are for the most part built of wood, and frequently consist of a single large white-washed room, spotlessly clean, the walls and ceiling hung thick with all manner of household goods and utensils.

The high iron stove is the most important feature of every dwelling in a country where the cold of winter is extreme. A highly colored print of the Virgin and pictures of one or more of the favored saints occupy prominent places on the

WITH THE HABITANTS AT HOME

At the Way of the Cross on the Hill.

Ste. Anne de Beaupré Procession.

The Sisters marketing.

Habitant home.

Photos, E. S. Watson.

Berthierville, habitants driving.

walls. The chairs and table are, as a rule, home-made. Two very high beds and bunks furnish sleeping accommodations for the family. Under the beds are tiers of long drawers arranged one above the other. Here is the sleeping place for the children, where you will often find from fifteen to twenty sleeping in their cozy and quaint beds.

THE LANGUAGE SPOKEN IN QUEBEC

The language is French from the Saguenay to the Ottawa, and in many communities English is never spoken and is understood only by the parish priest, or curé The language is far better than the language spoken by the peasant class in France. In some districts the people retain the language as it was spoken two centuries ago, though without the accent of the older provinces of their origin. In other places it has become mixed with many English words, and in these districts a patois, such as you may read in Dr. Drummond's poems, is spoken. It is hard to put into writing.

In rural Quebec.

The habitant is quite as strong in body as the man of English blood in Ontario, and is stronger than the peasant of France. He is a frugal, hard-working man, and nowhere will you find a race more industrious and law-abiding. His temperate habits make him a valuable employee in mills and factories of all kinds. Many prefer this life to that of the farm, and until recently there was a steady movement to the manufacturing towns of New England. Of late years efforts have been made to draw them back again to people the new lands in the north of the province.

THE LARGE FAMILIES OF THE HABITANTS

The thrifty habitant rears a large family and is taught that herein he is doing his chief duty to the French Canadian people. He is prouder of his large family than of any other of his worldly possessions. The poorer he is, the more delighted he appears to be with his children. Families of from fifteen to twenty children are not uncommon. Not all of them remain upon the land: some are sent to college and enter the professions, while others go into business or learn trades of various kinds.

The people are very devout Catholics. In the present, as in the past, the Church makes every effort to supervise with a zealous care the teaching and the reading of the people in the rural districts, where it exercises the greatest influence. The parish priest, or curé, is the most powerful and dominating person in the everyday life of the habitant. He takes a leading part in all the affairs of the parish, and in many instances he determines how his parishioners shall vote at elections.

To-day more independence of thought and action is showing itself in the country districts. The whole land is practically parceled out among the saints, as far as the names of the settlements and villages are concerned. The foremost saint appears to be St. Anne, whose name appears very frequently in all parts of the country. The schools are under the direction of the priests and religious orders.

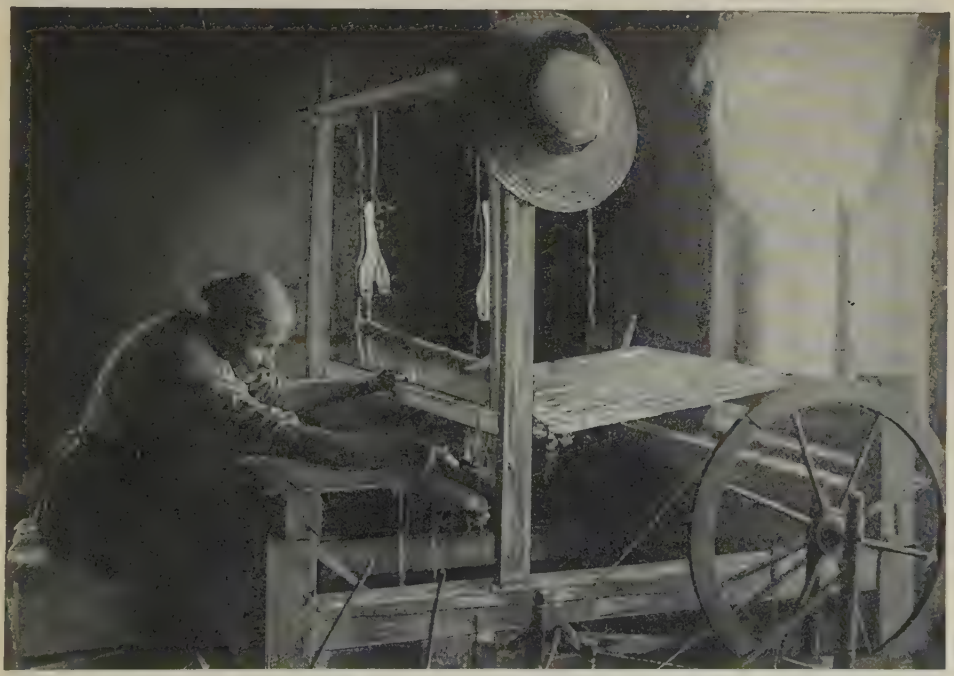
SUNDAY AS IT IS SPENT BY THE HABITANTS

Sunday is a great day, full of religious practices in the morning and of amusements in the afternoon and evening. The feasts of the Church are kept with great zeal, and consequently the French Canadian has holidays without number. The habitant lives contentedly on very little, and is happy as long as he is within sound of the church bells, goes regularly to confession and observes all the Church holidays.

Happy in his home and contented with his lot, the habitant's light-heartedness

AMONG THE HABITANTS IN QUEBEC

In the country districts of Quebec many of the habitants live much as their ancestors lived while the country was still a possession of France. This oven is built, as you see, out of doors. Naturally, fresh bread is not baked every day, but enough is baked at one time to last several days, as it is a considerable task to heat the oven. In former days the habitants had to bake in the seignior's oven.



A hundred years ago such a sight as this was common all over the country, but it has become rare, as factories have increased in numbers and now produce goods so cheaply. Many of the habitant women, however, still weave most of the cloth with which their families are clothed.

and freedom from worry show themselves in a variety of innocent amusements. He is a born story-teller, and nobody is fonder than he of music, song and story. Both young and old are very sociable in their habits, and love music and dancing. The violin is the favorite musical instrument, and all delight in the old-fashioned dances. The priests do not encourage reckless gaieties or extravagance in dress. Now and then the bishop issues an order forbidding the waltz and other fast dances and certain fashionable modes of dress. His

About twenty miles down the St. Lawrence from Quebec is the quaint little village of Ste. Anne de Beaupré. It is noted for its famous church, burned down but now again restored. It is visited every year, particularly on Ste. Anne's day, July 26, by thousands of pilgrims who hope to be cured of their ailments. Here we see the outside of the church and the altar, known all over the world.

orders are soon forgotten in the villages and the towns, but they are religiously observed in the country communities. The songs are the same in spirit, and very frequently in words, as those which their ancestors brought from Brittany and Normandy.

WINTER IN QUEBEC IS A PLEASANT TIME

When the days shorten and snow begins to fall, the habitant quits his farm and journeys to the nearest lumber camp. Not a man who can swing an ax or drive a team would miss his winter season in the forests. His social instinct is ministered to by the life in the crowded camp. The hard work in the bitter cold is made merry by shout and song. The long evenings are passed in the telling of stories and the singing of old French songs as the men lounge in their bunks or gather in groups about the roaring box-stove. The family at home also has its diversions. Some of the old men and women are accomplished story-tellers, and the children gather around the fire to listen breathlessly to accounts of the *loup-garou,* as well as to pleasanter tales.

And so it is that, while the habitant is not rich in money, he is rich in what money can never buy—contentment and health and friendship and laughter.

The habitant makes no effort to conceal his affection for France. His love for that country is for the land of his origin and his early ancestors. Proud as he is of his French origin, he objects to being referred to as "French." He feels that he is a Canadian; but he has not yet learned that his country is the wide land that stretches from sea to sea; and his loyalty is given almost wholly to his native province of Quebec.

WHAT THIS STORY TELLS US

LEGENDS and tales of the old days abound throughout the German states. Some story is connected with every stream, forest, mountain and castle. The more romantic the spot, the more numerous are the stories centring there. Though the events of this story are supposed to have happened in what is now Belgium, it belongs with other German tales. It was first told by a German writer seven hundred years ago, and several different versions, differing a little in names and events, have been written since. The great German composer Richard Wagner, who turned many legends into operas, took this story for his opera of Lohengrin. If you have not heard the whole opera, you have no doubt heard a part of it called the Wedding March, which is often played at weddings.

LOHENGRIN, OR THE SWAN-KNIGHT

CONTINUED FROM 2820

LONG ago, when Henry the German ruled over nearly all of Europe, and made successful war on those fierce destroyers the Huns, some strange things happened, of which I shall tell the story.

The Duke of Brabant, one of Henry's vassals, lay on his deathbed in the ducal castle at Antwerp. He was thinking of his children, Godfrey and Elsa, whom he must leave behind, and trying to choose from all his nobles the one he might best trust with their care, and the government of the duchy while they were children. At last he called Frederick, Count of Telramund, and charged him to rear the children in all virtue and nobility, and to guard the land for them till they should be grown and able to rule for themselves.

One day Elsa, who was older than her brother, led him into the forest near the castle. They ran along joyously picking flowers and shouting to each other over each new-found blossom. "See!" cried Elsa once when she had found a very lovely one, "Godfrey, see this pretty hyacinth." But her brother did not run to her side with his gay laugh, and when she looked up he was gone. She ran hither and thither, calling and searching, but at last, weary and weeping, she went back to the palace alone, where she was scolded and shut up in prison because she could not tell what had become of him.

It was not long after this that King Henry came to Antwerp to get aid from the people of Brabant in his campaign against the Huns. Frederick called the people together on a meadow, near the river Scheldt, to meet the king. He, with his wife and the nobles of Brabant, sat high on the bank above the meadow; and Henry, with his men, sat near him, but on the opposite side of a great oak.

When the people had become silent, King Henry said: "Frederick, Count of Telramund, before I call thy people to war, tell me, and thou canst, what is this I hear of the disappearance of thy ward, Godfrey of Brabant, and the charges against the Princess Elsa, his sister, and of thy claim to the late duke's crown?"

And Frederick replied: "I thank thee, gracious King, that thou hast come here to judge, and I will gladly tell thee all the truth. Elsa, by her own hand, slew her brother. Because of this I could not marry her, as the late duke had given me the right to do, but instead I married Ortrud, daughter of an ancient line of dukes. Now I claim the crown, both in my own right, as next of kin to the late duke's children, and in the right of Ortrud, my wife; for Godfrey, being dead, cannot inherit, and Elsa has lost the right through her crime."

"A grave charge," said the King; "let the accused be brought forward."

Elsa was then led before the king. She was fair and lovely, but seemed as if in a trance. At first she could say nothing, but when the king kindly urged her to confide in him, she began in a strange dreamy voice:

"Lonely and sad, I prayed to Heaven. My grief, so dolorous, charged all the air about with deepest pain. Then I fell asleep, and to me in my dreams a knight in glittering armor came and comforted my heart, and he will come again and be my champion to prove my innocence."

Then the king turned sternly to Frederick, and bade him be sure of the truth of his accusation ere he challenge such a vision; but Frederick appealed to the nobles, who raised a great shout, and said not one would doubt his word.

King Henry drew his sword and thrust it in the ground, saying: "Speak, Frederick, Count of Telramund, wilt by deadly combat submit thy cause to God?"

Bowing before him, Frederick replied: "I will."

"And thou, Elsa of Brabant," said the king, "wilt choose a champion to do deadly battle for thy sake?"

"Yea, most noble King."

"Whom choosest thou?"

Elsa looked up at the king, and then away into the far-distant sky, and spoke as if to someone far, far away, and yet very, very near: "I ask the God-sent warrior to be my champion, and he shall wear my father's crown and take me for his bride."

Then, at the king's command, the herald stood up and shouted: "He who, in God's name, fights for Elsa of Brabant, come forth."

All the court and people listened and looked, but no champion appeared. But as Elsa listened she seemed to awaken from her sleep. She stepped before the king and spoke in a clear, steadfast voice, looking straight into his eyes: "My dear King, let the herald call again, I pray thee, for my knight lives far and has not heard the summons."

The herald called again, but still there was no response. Then Elsa knelt and prayed: "Great Heaven, thou didst bear to him my sad lament, thou didst send him to comfort me. Send him now again, I pray, to champion my cause and set me free. Oh, let me see him now as once before."

Then King Henry and those highest on the bank saw afar off a ship approaching. The ship was drawn by a swan, and in its prow a knight, dressed in glittering armor, stood upright, looking toward the shore. "See! see!" shouted the people. "A boat! A swan! The wonderful knight!" Then all sat breathless while the boat drew near, and the knight, alighting, turned and bade his swan farewell:

"Thank thee, thank thee, dear my friend,
Sail across the deep blue sea,
When thou comest here again
May it be sweet joy to thee.
Be true, dear swan, farewell, farewell."

Then he turned and saluted the king, who asked him wherefore he had come, and he replied: "Most noble King, I come to champion a maiden who is in great distress because of a false accusation, whereof I will soon cause all the world to know her innocent."

Then he turned to Elsa, and said: "Wilt accept me, Elsa, and then choose me to be thy champion?"

Elsa knelt before him and called him her hero, her champion, her knight, and said she was wholly his.

"If I am victorious, wilt be my wife, Elsa?"

"Yea."

"But, Elsa, thou must promise never to ask my name, my rank nor whence I came."

"Never will I ask these questions, believe me."

"Elsa, hast well understood my meaning? Think, never must thou ask nor even think these questions."

"My shield, my angel, my savior, thou who believest in mine innocence, how great would be my sin to doubt thee! Verily, even as thou deliverest me in my need, so shall I truly keep thy command."

"Elsa, I love thee."

Then Elsa raised her face, and he stooped down and kissed her.

After this he turned toward the assembly, raised his hand for silence, and said: "Hear ye, most gracious King, noble Lords and warlike people, to all I proclaim Elsa of Brabant innocent, and to thee, Frederick of Telramund, I say, God's judgment shall soon prove thy charge is false."

His words rang so true that all the nobles begged Frederick to renounce his charge and yield the victory to the

strange knight without battle; but Frederick refused. He believed the truth of his accusation, he said, and would fight for it, and trust to God to establish the right. So King Henry commanded that preparations be made for the combat.

Heralds paced off the ground, and called aloud to announce the cause of the battle and to warn all against interference. Then, at a signal from the king, the fight began; but it did not last long, for Frederick was soon overthrown, and his adversary, standing over him with drawn sword, said: "Through Almighty God thy life is mine, but I will not take it. Go, make thy peace with thy Creator."

Then King Henry and all the nobles and people raised a mighty shout, proclaiming him the champion of truth, and amid great rejoicing he and Elsa were carried into the palace.

Ortrud and Frederick were alone outside. They could hear the sounds of rejoicing, but they might not participate. "Most hateful woman, deceiver!" said Frederick to Ortrud, "through you I am wholly undone and stand dishonored as the champion of falsehood: I, who ever loved the truth!"

"My husband, Frederick, Count of Telramund, why do you speak so to me?"

"Do you ask, deceiver? You! Did you not tell me that with your own eyes you saw Elsa kill her brother? By your lies you led me to love you and marry you. You made me hate her. Oh, and she is pure and you are vile! Viper! I hate you! Leave me!"

Then Ortrud, by sly and artful words and winning ways, made Frederick again believe in her and distrust Elsa and her knight. She made him believe that it was by magic and not by God's strength that the stranger had beaten him in battle, and she told him that, if the Swan-knight could be made to tell his name, his strength would immediately leave him. They must try to make Elsa break her vow and ask the forbidden questions.

She then waited outside the palace till Elsa appeared on the balcony, when, by piteous words, she won her compassion and admission to the palace, where she tried in vain with subtle words to make the young girl believe that her deliverer was an evil magician.

The next morning Elsa and her companions marched in stately wedding procession to the cathedral; but just as she was about to enter the door Ortrud sprang angrily forward and forbade her to go farther. Then, in the hearing of all, she repeated the lies she had told in secret the night before.

While Elsa stood, pale and troubled, doubting what to do, the other procession, with the king and bridegroom, came up.

"Elsa," said her knight, "who is speaking to thee? My love, is she teaching thee to doubt?"

But before Elsa could answer, Ortrud sprang forward and challenged the king to put the stranger to the test. "Ask him his name," she cried, and then repeated all her charge of sorcery and evil magic. In the meantime Frederick had found time to whisper to Elsa: "He will leave you in a day unless you break the magic spell by causing him to tell his name, his birth and whence he came. Break the spell and he will abide at thy side forevermore."

The Swan-knight said to Elsa: "Though the King and all his nobles ask me I need not answer, but to thee, if thou doubtest and would ask me these questions, then must I reply. What is thy wish?"

Elsa hung her head a moment, then looked up into her deliverer's eyes and said: "Though all the forces of doubt assail me, love will conquer, and I will keep my vow."

Then the procession marched with stately joy into the cathedral and the marriage ceremony was performed; but when all the festivities were over and Elsa was alone with her husband, the words of Frederick haunted her mind with terrible meaning. Would he leave her? She could not bear the thought. She began to question him, and with every question her terror grew. At last the forbidden questions had slipped the barrier of her lips: "Beloved, what must I call thee? Ah, but tell me thy very name."

"Elsa, ask not that."

"Yea, yea, tell me thy name. Whence camest thou? What is thy race, thy rank?"

Then she swooned, and the Swan-knight laid her gently on the couch, and tended her till the morning, when he

caused all the nobles and warriors, and the king with his train to assemble again on the bank of the river, and thither he repaired with Elsa, his wife, and there before them all he answered her questions:

"Lohengrin is my name; I am son of Parzival, who is King of the Holy Grail. I came from Monsalvat, and the Castle of the Grail. Thither I must now return. I came to succor Elsa, whom I love, but no Grail-knight may ever abide where doubt exists, nor where his name is known."

So he kissed Elsa, and was about to step into the boat, which had again come to shore, when Ortrud confessed her crime. She had changed Godfrey into a swan. "Ha, ha!" she shrieked, "'tis he that draws thy boat!"

Then Lohengrin knelt and prayed, and lo, a snow-white dove appeared to draw the boat, the swan sank into the river, and rose again as Godfrey, whom Lohengrin grasped by the hand, saying: "Dear friend, rule well thy land and aid thy king. Be true, dear one; farewell, farewell." Then he departed, but as the boat set off, Elsa's dead body lay on the shore.

They say her spirit sailed away in the ship with her husband, whom she had lost through the wicked advice of Ortrud.

A LITTLE GAME OF THINKING

"HAVE you ever played 'Thoughts'?" asked Uncle Harry.

The children had been bathing most of the morning, and prowling around all the afternoon, and now they were really too tired to do anything but sit still in the shade.

"No," said Phyllis. "Is it a game?"

"Yes," said Uncle Harry, "and a good one. First of all we choose a subject to think about, and then we let our thoughts travel on from that subject for one minute, and then we tell each other where they have led us."

Sid looked puzzled.

"I'll give you an example," said Uncle Harry. "We'll say that the subject chosen to start from is the grasshopper over there. Now take my watch, Sid, and tell me when a minute has passed."

Sid took his uncle's watch and kept his eyes glued to it.

"Time!" he called presently.

"Go ahead, uncle!" said Phil.

"The grasshopper made me think of the grass," said Uncle Harry. "And the grass made me think of lawns. And lawns made me think of tennis. And tennis made me think of the court at home. And home made me think of Boston. And Boston made me think of the office. And the office made me think of the city. And the city made me think of the State House. And the State House made me think of the sun shining on the dome. And that's as far as I got. So, you see, the grasshopper took me a long way from this pleasant spot beside the bay."

"Now let us try," said Phyllis. "You choose the subject, uncle."

Uncle chose the fishing-boat out in the bay, and he took the watch. Phil's eyes were soon gazing, unseeing, across the water, while Sid flung himself on the grass, dug his elbows into the ground, and put his hands over his ears, as though in shutting out sound he were also shutting in thought.

"Time!" said uncle. "We'll begin with Sid." So Sid began.

"The fishing-boat made me think of fishermen," he said. "And fishermen made me think of Old Jack. And Old Jack made me think of smugglers. And smugglers made me think of adventures. And adventures made me think of Treasure Island. And Treasure Island made me think of the Bermudas. And the Bermudas made me think of the lovely flowers that grow there. And the flowers made me think of Mother because she loves them so. And—and that's about as far as I got."

"Good, Sid! You started from the fishing-boat and reached Mother.

"I think you will generally find in 'Thoughts' that, somehow or other, what you are thinking about most of the time will come creeping in when you are playing. That is why Sid, who thinks about Mother so often, found that the fishing-boat led him to her."

"It's a jolly game," said the children.

It *is* a jolly game. Try it and see. The more there are playing, the more interesting it is; it is surprising to notice the different roads different minds take. And it is amazing that in one minute so many thoughts can pass through even the small head of a child.

STORIES TOLD IN THE MIDDLE AGES

LITTLE TALES FROM A BOOK THAT SHAKESPEARE READ

A famous story-book of the Middle Ages is a book written in Latin, called the Gesta Romanorum, which means, "The Exploits of the Romans." The book received this name because many of the stories were told about real or imaginary emperors of Rome. There are about two hundred stories altogether, and most of them are weak in incident and dramatic power; but it was in the Gesta Romanorum that Chaucer, Shakespeare and other famous poets found many of their plots. Here are some of the more interesting stories.

THE SON WHO DID HIS DUTY

A CERTAIN soldier went on a long journey, leaving his wife and son at home. In a distant land the soldier was made a prisoner and kept in close confinement, but he was able to send a message to his wife and son telling them of his fate and asking them to do all they possibly could to collect a sum of money to pay for his release.

The wife was so distressed at the sad news, and wept so much, that she became blind; and the son was then in great trouble, for he knew not what to do. He was anxious to run to his father's help, but at the same time he could not bear the thought of leaving his blind mother alone while he was away.

After thinking over the matter for some time, he at last determined to go to release his father; but first of all he made careful arrangements for his mother to live among friends and be properly cared for during his absence. Then he traveled to his imprisoned father, obtained his release, and the family were once again united and happy, and the mother gradually recovered her sight.

THE DOGS THAT BECAME FRIENDS

THERE was a king who had two greyhounds, and these were kept chained up at some distance from each other. But as soon as they were let loose they flew at each other, and began to fight most fiercely. The king consulted one of his wise men as to what could be done to make the dogs live together as friends.

"Take them into the forest," said the wise man, "and when you see a fierce wolf or a wild boar, let one of the dogs loose. The wild animal will attack it. But just as it is being overcome, let loose the other dog, which will fly at the boar or wolf, and the two dogs together will be more than a match for the wild animal." The king did this. A wolf appeared, and one dog was let loose. When its strength had nearly failed, the other was let loose, and the fierce wolf was slain. The first dog was so grateful to its companion for saving its life that ever after the two animals were faithful friends.

ALEXANDER AND THE PIRATE

A SEAMAN named Diomedes for a long time sailed the seas in a galley, attacking shipping, plundering cargoes, and sinking vessels. At last he was captured and brought before Alexander the Great, who asked angrily how he, a nameless adventurer, dared to trouble the seas as he had done.

"Sire," said he, "ask rather how you dare to trouble the earth. I am master of only a single galley and do but little harm, while you are master of great fleets and carry desolation and war. Yet I am called a robber, and you are a king and conqueror. Should fortune but change, and I become more successful while you become less successful, our positions might be reversed."

This argument so struck the king that he made the pirate a wealthy prince, on condition that he should give up his life of robbery and become an honest man.

THE CONQUEROR'S TRIUMPH

A CERTAIN king, after a great victory, appointed three honors for his successful general. He decreed that the victor should be greeted with loud cheers, that he should enter the capital in a triumphal car drawn by four white horses, and that the captives should follow the conqueror's chariot, bound hand and foot.

The general was delighted, but when the time came for the honors to be enjoyed, he found that the emperor, in order to keep him humble amid success, had appointed also three annoyances which would accompany the honors.

First of all, a slave rode by his side in the triumphal chariot, to remind him that even the poorest and least of mankind could attain to a position such as his; in the second place, the slave struck him a blow whenever the people cheered, so that his pride might be checked; and, in the third place, the people were al-

lowed free license to shout the most insulting remarks while the victor enjoyed his triumph, so that he might be reminded of his weak points.

TWO GUESTS AT A FEAST

A GREAT king made a feast and invited everyone to it. He sent out messengers to all the cities and towns in his kingdom, asking the people to come, promising both food and wealth.

In one town there was a strong, robust man, who, unfortunately, was blind; and he loudly bemoaned the fact that his affliction would prevent him from accepting the king's invitation. But presently he heard that in the same town was a lame man, who was also grieving that he would be unable to go to the feast.

The blind man and the lame man therefore came to an arrangement by which the blind man would carry the lame man to the feast, the lame man directing him. So the man who had sight but could not walk guided the man who could walk but could not see, and the two went together to the king's feast.

HOWLEGLASS, THE MERRY JESTER

The History of Howleglass is a famous German book of stories which was written in the early sixteenth century, and was very popular in England in the reign of Queen Elizabeth. Howleglass is a wily peasant who travels about a great deal, and wherever he goes he plays pranks that make people very angry at first, but afterward cause them amusement. The following are some of his adventures:

THE DINNER AT THE CASTLE

HOWLEGLASS at one time enlisted in the service of the Count of Ambal, whose castle was surrounded by enemies. Howleglass was placed in the watch-tower and told to keep a sharp look-out and to blow a horn if he saw the enemy approaching.

Shortly afterward he heard the count and his chief officers go into the great hall to dinner, and the smell of the dishes was too much for Howleglass. So he gave a great blast on his horn, and while the count and all his men ran off in great alarm to their posts to withstand the enemy Howleglass rushed down and ate his fill of the victuals provided.

THE THREE GREAT QUESTIONS

ARRIVING at Prague, Howleglass posted a notice on the doors of the churches that he would answer any questions that might be asked of him, however difficult they might be. He was taken to the university and questioned by the rector before all the students, who had gathered to hear the visitor.

"How much water is there in the sea?" asked the rector.

"Stop the tides," said Howleglass, "and I will measure it for you."

The rector said he was unable to do that, and asked a second question.

"How many days have passed away since Adam was alive?" said he.

"Seven," answered Howleglass without hesitation, "for when seven have passed, seven begin again, and so it goes on to the end of time."

"Where is the centre of the world?" asked the rector.

"Why, this house, to be sure," replied Howleglass. "Measure the world with a long cord and you will find I am right to an inch."

"How far is it from earth to heaven?" said the rector.

"Very near indeed," answered Howleglass, "for when we pray ever so low on earth, it is surely heard in heaven."

"But how large is heaven?" questioned the rector.

"Just twenty thousand leagues," replied Howleglass; "and if you doubt me, go and measure it, including the sun and moon and stars."

At this point the rector had to own that he could ask no question to which Howleglass had not an excellent answer.

THE WONDERFUL HORSE

HOWLEGLASS, on his travels, once came to the city of Halberstadt. Soon his money was exhausted, and in order to get more he asked the town-crier to advertise a wonderful show that would be open on the following day.

"Come," he said, "and see the strangest horse that ever lived. Its tail is where its head should be."

The people flocked to see this strange animal, but on entering the stable where it was kept they found an ordinary horse with its tail tied fast to the manger.

The folk could not help laughing at the way they had been hoaxed, and Howleglass made them promise as they left that they would not reveal the secret.

STORIES TOLD IN THE OLD ENGLISH SCHOOLS

One of the first books on education ever written and printed in English was Sir Thomas Elyot's Governour, published in 1531. It is a remarkable book, for its enlightened views are worthy of the twentieth century; and much that is done in the education of children to-day was first suggested by its author. The book is full of interesting stories which used to be told in old English schools to illustrate lessons. Some of these stories are given here.

THE MASTER AND HIS SCHOLARS

WHEN Dionysius, king of Sicily, was exiled by his people, he went to Italy and set up a school for boys, to whom he taught grammar and other subjects. His enemies laughed at him for this, declaring that it was quite beneath the dignity of one who had occupied a throne to keep a school. But he replied that though he had been turned out of Sicily, he was still a king, for he had authority over his scholars.

His enemies then asked him what good Plato's philosophy was to him in his trouble, for he had studied it deeply.

"Ah," replied he, "it enables me to bear misfortune with patience!"

So moved were his former subjects by his fortitude that they recalled him to the throne—a dignity which he would probably never have regained by the sword.

THE TWO FRIENDS

ORESTES and Pilades were two youths who were remarkably alike in appearance, and remarkably fond of each other. One day Orestes was seized by command of a tyrant, who hated him deeply and had determined to put him to death. But Pilades accompanied his friend into the presence of the tyrant, and, in order to save the life of Orestes, declared that he was the man sought.

The real Orestes, however, maintained that he was the man who was wanted, and so perplexed was the tyrant that he knew not which of the two to condemn. At last, when the youths continued striving to receive condemnation in order that each might save the other, the tyrant's heart was softened, and he set them free.

THE CONQUEROR AND THE ARTIST

ALEXANDER THE GREAT, who conquered nearly all the world, one day went into the studio of an artist, and, while watching the man paint, spoke of drawing, and color, and other subjects about which he knew little or nothing.

At last the artist turned round, with a smile, and said to the king: "Do you see, noble prince, how even the boy who is mixing my colors is laughing at you?"

Instead of getting angry the king accepted the rebuke and ceased to talk glibly about what he did not understand.

A TRAITOR WHO BECAME LOYAL

IT was once reported to King Philip, father of Alexander the Great, that a certain captain had been plotting against him, and the king was urged to have the man imprisoned. But Philip declined, in spite of the continued warnings of his courtiers and friends.

"If any part of my body was sick," said he, "should I cut it off and cast it away? Should I not rather do all I possibly could to heal it?"

He thereupon invited the traitorous captain to the palace, loaded him with gifts and honors, and in this way made him ashamed of his treason. The captain afterward became one of the most loyal and most loving subjects of the king.

THE KING WHO WAS LOVED

CRŒSUS, the rich king, was captured by Cyrus, king of Persia, and one day, after seeing the liberality of Cyrus, he said: "Surely if you give away like this you must become very poor, whereas if you keep your wealth you would soon have great riches."

"How much do you suppose I should have now," asked Cyrus, "if, during all my reign, I had kept everything and given nothing?"

Crœsus named an immense sum.

"Well," said Cyrus, "I will send round to my friends and subjects, and tell them that I need money for some object, and you shall see the result."

After the messengers of Cyrus had been round, the king took Crœsus to see the gifts they had sent. Crœsus was amazed, for there stood a great heap of gold, of far greater value than the sum he had named as being what Cyrus might have saved had he been a miser.

"If I had hoarded and guarded my wealth," said Cyrus, "I should be envied and hated by my people; whereas I am loved and trusted by my people, and can in a moment have more gold than ever I could have saved in many years."

THE SOLDIER AND HIS JUDGE

ONCE when King Philip, father of Alexander the Great, was trying a prisoner, he fell asleep; and then, waking suddenly, he at once gave judgment against him. But the soldier cried out: "King Philip, I appeal against your sentence!"

"To whom do you appeal?" said the king angrily.

"I appeal from Philip asleep to Philip awake," answered the soldier, facing his judge nobly.

The king was impressed by this reply, and feeling the justice of the man's appeal, he went thoroughly into the case, found that he had greatly wronged the soldier, and at once had him set free.

THE BATTLE WITH THE LION

AT one time, when there was no battle in progress, Alexander the Great became tired of inactivity, and ordering a fierce lion to be brought into his presence, he fought it single-handed, and after a terrible struggle finally slew it.

A courtier, who disapproved of the king's risking his life thus needlessly, being asked his opinion of the battle, replied in these words of great wisdom: "I wish with all my soul that your Majesty might fight with a lion for some great empire!"

By this answer the courtier, while praising the king's bravery, at the same time hinted that only for a great cause, and not for mere pride of victory, should he thus risk his precious life, which was of such importance to his people.

HOW ALEXANDER CROSSED THE RIVER

WHEN Alexander the Great was going to war against the Indian king Porus, he and his army had to cross a wide river. The horsemen went in, and the animals were soon up to their necks, so that it was impossible for the foot-soldiers to cross the river by a ford.

The men could not swim and were afraid to go into the water. Seeing this, Alexander, who himself could not swim, wrung his hands, exclaiming: "Oh, most unhappy that I am, never to have learned to swim!"

Then, seizing a shield from a soldier and throwing it into the river, he stepped upon it, and, balancing himself with his spear, crossed to the other side, using the shield as a raft. This encouraged the foot-soldiers, and in one way and another they all managed to cross the river.

THE FARMER AND HIS DOG

A POOR farmer by the banks of the Nile had a good dog, which had to go hungry for some days because the farmer had no food in the house. There was a village across the river, where any dog that knew how to forage could manage to pick up a living. The farmer's dog was well acquainted with the place, as he had often gone there with his master in a boat. But swimming across the great stretch of water was dangerous, and the river was full of fierce crocodiles.

Being pressed by hunger, however, the dog finally risked it. He arrived at the village, but on the way he had two such narrow escapes that for some time he was afraid to swim back. Meanwhile he found as much food as he wanted, and grew plump and fairly happy.

But being of an affectionate nature, the dog was troubled by his separation from his master, and his sadness made him as miserable as hunger had made him before. At last he resolved to return. But how could he get back safely? Sometimes a boat crossed the river, and he would then try to get into it. But the boatmen would not have that, and one day the dog stood howling by the riverside at a departing boat, when the crocodiles, attracted by his cries, came swimming to the spot, thinking no doubt, that they could easily take him.

This seems to have suggested to the dog a clever plan of escape. As night began to fall he again came to the riverside, and stood howling with such a show of anguish that the crocodiles crowded once more to the spot, hoping to find an easy prey. But while they were peering about, the dog was tearing along the bushes by the bank as fast as his legs could carry him.

Two hundred yards away he silently slipped into the river, and, having now a clear way before him, safe from the crocodiles, he swiftly swam back to his master's house. There he received a loving welcome and a good supper, for the farmer had now reaped and sold his corn, and he was very glad to find that his dog had not forgotten him.

THE ADVENTURES OF REYNARD THE FOX

Nobody knows who wrote The Adventures of Reynard the Fox. They are about a thousand years old, and are found among the ancient literature of many countries. Reynard is an artful knave who deserves to be punished for all his evil deeds, but somehow manages to escape every time. The stories were written as parables—that is to say, as stories with an inner meaning—and they were meant to point out the evils of rulers and priests in the days when men did not dare to write openly of such things. The truths in these parables never change.

REYNARD IS SUMMONED TO COURT

SIR TIBERT the Cat was sent by King Lion to summon Reynard the Fox to appear at court, there to answer for all his offenses. At first the cat did not

Reynard showed Sir Tibert the hole.

want to go for fear that some evil should overtake him, but at last he was persuaded and set out.

When he arrived at Reynard's castle, the fox promised to return with him to the court. "But," said the fox, "you must remain for the night, and to-morrow we will travel together." Sir Tibert agreed to this. Then the fox began to lay the table for a meal, but all he could provide was honey.

"That is food I care nothing about," said the cat. "Have you not a mouse?"

"Oh," replied Reynard, "come with me to the priest's barn: it is full of mice!"

So the two set out, and presently they came to the barn.

"There is the entrance," said the fox, pointing to the hole by which he had himself entered the night before and stolen a good fat hen.

Now, the priest had set a trap near the hole, inside the barn, and when Sir Tibert crept in he was caught in the trap. His mewing soon brought out the priest, who, supposing him to be Reynard, began striking out with a stick. Thereupon Sir Tibert seized the priest's leg with his teeth. This gave the worthy man something to think about, and while he and his wife were attending to the wound, Sir Tibert bit through the cord that held him and made off. All this time Reynard was hiding in the bushes close by, and laughing most heartily.

REYNARD TELLS OF A TREASURE

WHEN at last Reynard the Fox was brought to the court, so many witnesses appeared against him that he was sentenced to death. Just before his execution he asked that he might make a confession of all his misdeeds, for he now felt very penitent; and in the course of this confession he said something that made the king listen very carefully.

"My lord the king," he declared, "in Flanders there is a dense wood by a river, and in it I have hidden a great treasure—money, jewels, precious stones—and I want you to get this treasure; then perhaps you will remember your devoted servant Reynard."

The animals who had accused the fox now began to feel very nervous, for King Lion, having learned exactly where the treasure was supposed to be hidden, forgave the fox and made him a noble.

"Hear, all you knights and gentlemen," said the king, "Sir Reynard is now one of the chief officers of my court, and I do charge you, upon pain of death, to show him the greatest reverence at all times and in all places."

"Where is Kayward?" asked Bellin.

Reynard then asked permission to make a pilgrimage to Rome, and he set out, accompanied by his enemies the hare and the ram, who were now his humble, though unwilling, attendants.

Soon the party arrived at Reynard's house, and the fox asked Bellin the Ram

to keep guard outside, while Kayward the Hare went into the house to see Reynard's meeting with his family. Once inside, it was not long before the hare was killed and eaten.

Then the fox came out, and giving a bag to the ram, asked him to take it to the king.

"Where is Kayward?" asked Bellin.

"Oh, he is talking with his aunt. He will soon overtake you."

The ram carried the bag to the king.

"Sire," said he, "this is a present from Sir Reynard, who rested for a few hours at his castle before going on to Rome."

"Open the bag," said the king.

The bag was opened, and out fell the head of poor Kayward the Hare.

"Alas!" said the king, "unhappy monarch that I am, ever to have given credit to a sly and traitorous fox."

REYNARD AGAIN ESCAPES

THE day after Bellin the Ram had brought the head of Kayward the Hare to the king from Reynard, Laprel the Coney came into court crying:

"O king! deliver your subjects from the wicked attacks of Reynard the Fox. I was passing his castle yesterday, and he came out telling his beads so devoutly that, instead of hastening away, I saluted him very humbly, and immediately he gave me such a terrible blow with his paw that I was nearly killed."

The Rook bent to see if he was breathing.

At this moment in came Corbant the Rook in a great state of excitement.

"Oh, my lord, hear me!" he cried. "I was on the common this morning, when I saw Reynard the Fox lying apparently dead and stiff on his back. My wife went and put her head to his mouth to see whether he was breathing, when suddenly the wicked creature snapped at her and bit her head right off. Then he made a dash for me, and I only just managed to escape."

The king was furious. Reynard was brought before him and sentenced to death once more, but again escaped by talking of the hidden treasure and by promising to go in search of it himself.

REYNARD'S BATTLE WITH THE WOLF

AFTER King Lion had pardoned Reynard for the second time, Isengrim the Wolf made all kinds of accusations against him, and it was decided that the two animals should fight a duel.

The fox knew that it was only by

Reynard smote the Wolf with his tail.

trickery he could win, and he sought the aid of a friend of his, the ape's wife.

"Shave all the hair off your body, from head to tail," said she, "and cover yourself with oil."

This Sir Reynard did, and then in the presence of the king the fight began.

Every time that Isengrim tried to seize Reynard, the fox slipped away, as his oily body was too slippery for the wolf to get a grip. Then the fox would smite his enemy in the face with his tail, and before he had recovered from the blow he would throw up in his eyes clouds of dust. This nearly blinded the wolf, and gave the fox an opportunity to chastise him. So the fight went on, until the wolf got the fox down and had one of Reynard's paws in his mouth.

Reynard was now in sore straits, but with the other paw he pinched the wolf, and when Isengrim opened his mouth to howl, Reynard snatched out his paw. Then the wolf fainted, and Reynard, laughing triumphantly, dragged him round the arena by his hind legs.

The king now pardoned the fox, and made him Lord Chancellor of his kingdom.

THE NEXT STORIES ARE ON PAGE 3077.

The home of the Sociable Weaver Birds.

STARLINGS, FINCHES AND BUNTINGS

CONTINUED FROM 2900

NATURE seems at times to have turned from the creation of the sublime and the sombre to the evolution of the comic. At any court of birds the Starling would assuredly fill the rôle of jester. Both build and habit fit him admirably for the serio-comic part.

The starling is a British bird which has been introduced into North America, though it is not yet very common. It has a squat little tail and a long, business-like beak, rufous-tipped black plumage, and strong, active legs set wide apart. On these it walks, struts and rushes with the excessive haste with which the clown in the circus races about the ring, pretending to help, and always getting in somebody's way. The starling is here, there and everywhere, never pausing, ever trying to be in a dozen places at once, ever glad to buffet a neighbor who crosses his flit-flirt track, and with a quick eye for food, alive or dead.

When he mounts aloft to a chimney-stack, he pours out his little heart in a lay of rapture, the funniest lay ever invented by the throat of bird. He can whistle as sweet a note as you can wish to hear, but he gabbles and gurgles, chuckles, wheezes and screams as if life were a great joke and he the cause of the fun. It is impossible to be dull when this feathered jester is telling his tale of comedy to the air.

It is possible, however, to be sad when he is at work on the ripe fruit. He carries an appetite big enough for a bird three times his size, and with him go a multitude of his kind. Fruit-growers will not hear a word in his favor, for even if starlings are good things, then, say they, they have too much of a good thing in this species.

Perhaps it is because so many of our wild birds of prey have been killed that the starlings have multiplied so astonishingly. One has seen them rise in such a mass from a newly plowed field that the entire surface of the soil seemed to be uplifted. A pheasant was killed not long ago as it flew into one of these uprushes of starlings. But we know what the birds are doing in such fields. They are devouring wire-worms and other enemies of the crops. So they save for human consumption food which, but for their active help, would be eaten by our insect foes.

With his comic strut on the lawn, his heavy flight and graceful gliding, his great concerts in the tree-tops when leaves are fallen and memories of glad summer days have flown, the starling remains welcome still. He is worth his little tithe of fruit: his work has helped to bring it to harvest.

The starling is a talker, under instruction, when caged. His nearest aristocratic cousins have not that distinction, but claim consideration solely on the grounds of splendor. They

have a good title to fame. The Rosy Starling, an Asian bird which has penetrated into Europe, is perhaps the handsomest European bird. It is a beauty with a gleaming crest of black, and the back and breast a rosy pink.

A GAY LITTLE MIMIC THAT TALKS AND WHISTLES A TUNE

Any summer may bring a few of these birds to Eastern Europe. They do come at times, and then it is interesting to note that they find out the native starlings and take part and lot with them, though in warmer climes they feed themselves and their young almost exclusively on locusts.

The mimicking faculty of the family comes out strongest in the Indian Mynas, which are but starlings, though we are much too proud of them in our aviaries to call them by so common a name. They can be taught to whistle tunes as accurately as a bullfinch, and to talk as well as a parrot.

These birds come between the rosy starlings and the Pied Starlings of India and the Wattled Starlings of Africa. There was a wonderful crested pied starling peculiar to the island of Réunion, but that passed in the nineteenth century, as the passenger pigeon of America disappeared a century later.

THE OX-PECKER OF AFRICA AND THE DANGER OF HIS GOOD TURN

The family of starlings is widespread and of many species. Those remarkable birds, the Ox-peckers, are but starlings; and they do for cattle and the wild beasts of the Dark Continent what starlings do at home for lawns infested with bugs and worms. They scavenge the hide as our birds scavenge the soil.

As a woodpecker runs over the trunk and boughs of a tree in search of his prey, so these birds run over the hide of an animal in quest of ticks and other parasites. They save endless money in the preservation of cattle. But there is a danger in this well-doing.

They have been accustomed to clearing up the hides of rhinos and hippos, and the tough coats of buffaloes. Therefore they are not always able to calculate the force with which they aim at the tender hide of a beast in captivity. And there is a fear among African farmers that the ox-peckers may develop a taste for blood drawn from the flesh of cattle and horses when their too-vigorous bills have penetrated the hides.

Were such a thing to become habitual with these birds, the consequences would be unfortunate. In some mysterious way the Kea began its horrible traffic on the backs of New Zealand sheep; in some such way the flies which kill the foals and cattle born in the wilds of certain parts of South America started their hateful blood-quest. The fat of sheep, the blood of foals and calves, the vital sap of cattle and horses are new sources of supply to kea, flies and ox-peckers. We never can predict the outcome of a change in the habits of wild things.

For the rest of the group, we can with unfeigned heartiness rejoice at their existence. The Glossy Starlings, Long-tailed, Short-tailed, and the rest, are exquisite examples of shape and coloration, in which every shade of green, purple, bronze, black and pure gold mingle.

THE HANDSOME DRONGO, WITH A TAIL LIKE A BIRD OF PARADISE

Next come the Drongos, a far-scattered tribe found in Africa, Australia and parts of Asia, handsome in a fantastic way. Some have flaunting tails which produce wiry streamers tipped with feather, like those of some of the paradise birds. Indeed, some of the Racket-tailed Drongos are called Paradise Drongos. Some naturalists group the drongos with the shrikes, some with the tree-creepers, but the covering name for all is King Crow.

Their habits are as varied as their species. Some confine themselves to the tops of tropical fruit-bearing trees; some valet the hides of cattle; others behave in flycatcher fashion, poising upon stump or bare tree to spring up and pounce on flies or other winged insects, then returning to dine with much gravity on the place from which they set out.

The glorious golden-tinted feathers of the Orioles suggested precious metal to the man who named these exquisite crows, for their name comes from the Latin word for gold. Not all the genus is golden of feather, but there is luxuriant beauty in the Green Oriole's covering, and sweet melody in his voice.

The one which gives his name to the group, the Golden Oriole, is greatly beloved in Europe. Though adult birds are apt to pine and fade in captivity, young ones can be reared. Exotic in appearance, the golden orioles flourish in many parts of Europe, as well as in Asia, Africa and Australia.

A LITTLE FLOCK OF BEAUTIFUL BIRDS

The Rosy Starling.

The Whydah.

The Common Myna.

The Black-winged Grackle.

The Cowbird.

The Superb Tanager.

The Blue Tanager.

The Red-crested Cardinal.

The Hangnest.

Jackson's Whydah.

The Australian Oriole.

These bird photographs are by Messrs. Berridge, Bickerton, Brook, Chislett, Crook, C. Kearton, Parkin, Pike, Reid, Taylor, Williamson, Wood.

THE ORIOLE'S HOUSING PROBLEM—"SAFETY FIRST"

How they manage to hide themselves securely in a European spring, when the branches are bare, is a mystery. They escape their greatest enemy, the hawk, by flinging themselves headlong into tangled thorny bushes where he cannot follow; but the bare tree-tops are an invitation to assault and treachery on the part of a multitude of enemies. Yet the oriole prospers in life, and he must know best where safe housing is to be sought.

A famous genus akin to the orioles comprises the American Troupials, of which the Cassiques are often ornately crested. Then come the Hangnests, of which the Baltimore Oriole is noted for the structure of a gourd-shaped hanging nest, wider and shallower than that made by the cassique, but exquisitely fashioned. It is cunningly threaded upon a bough so slender that not the boldest cat dare venture out, and high enough from the ground to defy the wildest spring upward by a hungry assailant.

There is a similarity, of course, in all these hangnests; but it is a striking evidence of something like thought that where birds of prey must be feared the builders knit up the entrances to their homes tighter and tighter, in accordance with the danger to which they are exposed.

THE CHEERY BOBOLINK THAT SINGS AT ITS WORK AND PLAY

From that high scale of architectural cunning we pass at a step to the sweet-voiced Bobolink, whose nest is rough and built in the grass. The bobolinks are ground-feeders; where rice and grain are, and the climate is kind, there bobolinks will be as well. There is no cheerier bird than this; it sings as it rests, it sings as it flies, it sings at its work hidden from sight in the fields. In southern United States it is called the Reed-bird, or the Rice-bird. Read the poem Robert of Lincoln on page 5523.

Another step and we reach the Cowbirds, so called from their habit of perching on, and searching, the hides of cattle in America, as the ox-pecker browses on the ribs of African animals.

Here we have creatures which have degenerated into the cuckoo's habit of foisting their eggs on other birds. Some will drive away the owners of home and eggs, and lay their own eggs and brood them there. They will even stab their beaks through another creature's eggs, place their own in the fouled nest, and leave the rightful owner of the nursery to bring up a vicious alien. Should the lawful heirs to the nest be hatched, the young cowbird will squat on them and suffocate them. The beguiled parents throw out the corpses and blindly nurture the murderer.

This parasitic habit of birds is a big problem. All we may stay to note is that the cowbirds, like the cuckoos, do not mate; therefore no pair makes its own home, but steals accommodation where it can. It loses more and more its fine instincts and intelligence with its debased habits, and, as often as not, cowbird will pierce cowbird's eggs in filling a rifled nest. A species makes war on its kind in a way happily novel in the realm of birds.

THE COWBIRD AND THE CUCKOO, WHO FORGET THEIR CHILDREN

The cowbird and cuckoo are glaring exceptions to the rule that a mother shall not forget her young. They do not have the toil and terror of the long wait before the child quits the well-guarded egg, the heroically defended nest.

Let us leave these degenerates and attain a new height of art and zeal in meeting the Weavers and their allies of Asia and Africa. They are a finch-like group, short-winged and stout of beak. Some are built on the lines of larks, some of refined sparrows. Those powerful conical bills can do many things. We cannot notice all the species, but every aviarist knows them — the Napoleon Weaver, the Yellow-shouldered, the Crimson-crowned, the Oryx, the Red-headed or Madagascar, the Orange Bishop, the Masked, the Paradise Whydah, the Yellow-backed, the Combassou.

They are all remarkable for this, that at the opening of the courting season the males make a great change in plumage. An ordinary weaver, in normal attire, is like a larger sparrow with an exceptional beak. But at mating time away go the old features; pale browns give place to gorgeous scarlet, gold, lustrous black; even the tint of the beak becomes intensified. And the temper and arrogance they develop!

THE FEATHERED BUILDERS AND THEIR CITY OF LITTLE NESTS

The males are the great builders here. They weave the loveliest little toy nests

THE JOLLY HOMES OF THE BIRDS

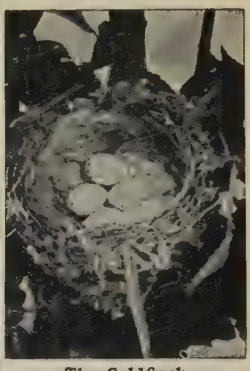
The Chipping Sparrow.

A colony of Weaver Bird nests.

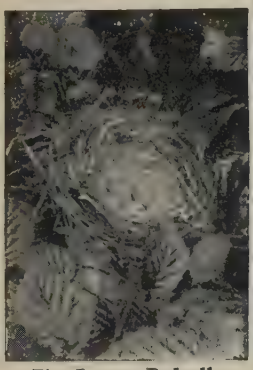
The Weaver Bird.

The Reed Bunting.

A Weaver Bird and its nest in Kenya.



The Goldfinch.



The Lesser Redpoll.

The Bullfinch.

The Twite.

The Linnet.

The Yellow Hammer.

merely to match the elegance of their feathers. Such nests are never used by the builders; the real nurseries come later, when mates are fought for, won and possessed. Not all are great builders; not all are great show birds. The whydah is content with a nest thrown together of humble materials down in the sedge and reeds. With his great sickle-shaped tail feathers the male is happy to flit short distances through the air. He is a light and buoyant, but an inefficient flier, happy to dazzle with his irresistible tail.

But the true weavers, especially the social species, make cities of a clump of trees. They convert a tree into a myriad of weaver nurseries, each nest a little masterpiece of weaving, constructed by a deft art which our finest machinery does not excel. For that we admire them, but the plumage changes are not less marvelous. When you have a little brown slip of a thing no bigger than a baby lark and see it slowly change from an ugly duckling into a gorgeous little swan—well, then you know the joy of bird-keeping. They change from grayish brown to the loveliest imaginable indigo, with a sheen like enamel over all. There is a blue bird indeed—the little combassou.

THE UNLOVELY NAME OF A BEAUTIFUL LITTLE BIRD

Another pretty small bird in the group is the Cut-throat Finch. It has a bar of delicate red beneath its throat—hence its unlovely name; but the title is the only unpleasing thing about it. Allied are the Java Sparrows, sleek, handsome creatures, of silver and leaden gray, with black markings, and snowy white upon the cheeks. These birds have tremendous beaks, and tempers to match; yet one has seen them strike up the strangest friendships with birds of an entirely different order, after bullying small specimens nearly related to themselves.

Every aviary-lover could write a loving chapter on the Tanagers, delightful American birds, every species of them—the Violet, the Scarlet, the Crimson-headed, the Blue-and-yellow, the White-capped, and so on. Their close relatives are the Honeycreepers and the delightful little Banana Quits, which consort with humming-birds and visit the same flowers, not for honey, but for insects sipping the honey of some deep-bowled flower.

These birds cannot hover in the air as the nectar-quaffing humming-birds can, but can scale a flower as if it were a wall, and hang upside down from it. We must dismiss briefly Wood Warblers, of whose thirty-five species North America is justly proud in the possession of twenty-six peculiar to herself. A famous example is the Yellow Warbler, or Yellow Bird; a second is the famous Blackburnian Warbler, whose breast of orange glows like a torch.

THE MESSENGERS FROM OVER THE SEA THAT GAVE HOPE TO COLUMBUS

Perhaps the most interesting is the Black-throated Green Warbler, a melodious creature of the New World, which from time to time weathers great gales in the Atlantic and rides the storm to Europe. Undoubtedly such examples are windborne. We like to fancy that this bird was among those whose arrival from realms unknown seemed a miracle, and helped to fire the dreams of Columbus when he was brooding on the great quest which was to take him to the West in search of the East.

We have passed without a word over the Waxbills, lovely little things which we wrongly call Finches. Now we come to the real finches, a most important group of hard-billed seed-eaters closely allied to the examples we have just been considering. They are important in two ways. They damage our crops and spread weeds. On the other hand, they carry good seeds as well as harmful. It is very clear that they have had a part in conveying the growths of one land overseas to other lands. Also they eat myriads of insects, and thus are doubly useful to man. Certain seeds which they eat pass unharmed from the body, and, ripened in one country, are carried to germinate in another. Wild cotton has been found luxuriating in little explored Northern Australia; and surely the seeds of the plant must have been carried there from afar by seed-eating birds.

First in the list is the Greenfinch, a real friend as a snapper-up of wild seeds which, if left alone, would cover our fields with weeds. The greenfinch will mate with the canary, the goldfinch, the bullfinch and the twite; of itself it has sweet notes, but too few of them. The Purple Finch is a better singer, and has a wide range. Bodily well-being is guaranteed to the European Hawfinch by one of the most formidable of finch beaks, and the bird has a grinding mill within,

which, if we possessed the like, would guard us against all the miseries of indigestion.

THE CARDINALS WHO STAND TOGETHER IN SOLEMN CHATTER

Power and size of bill give their name to the Grosbeaks, American birds with which the Red Cardinal and the Rose-breasted Grosbeaks have made us pleasantly familiar. There is great fun in watching two cardinals together. They stand head to head and mutter and chatter with such solemnity and seeming sagacity that they might be settling the affairs of the whole bird world. Sometimes they raise their scarlet crests as if in warning and mutter wordless secrets; the beaks work as if in speech, but never a sound is uttered. These birds are sometimes called Virginia Nightingales. The bird has some sweet, round, piping notes, but is no nightingale.

We turn now to another beauty bird—the European Chaffinch, a soft harmony of fine colors, with a song that is a hurried cascade of descending liquid music, and a nest-builder rivaling the wonders of birds world-famed for art in this direction.

In Northern Europe we find the Brambling, a biggish finch with a sharp, strong beak, and plumage in which rich black and handsome brown predominate. As its eggs are more numerous than those of any other finch—rarely fewer than six—we may know that this bird is the victim of many perils. Its nests are in the Arctic; only its winter larder is in the temperate lands. Perhaps that is as well, for bramblings are jay-like in their affection for the contents of the eggs of other birds.

Such habits and such dangers as those perhaps account for the defensive alliances of little birds such as the Siskins. These inhabit both the Old World and the New; but, go where we may, we find the siskins, with their dainty plumage of predominant yellow and green, and their neat, forked tails, always associated in large numbers. They quarrel a little among themselves at times, but are resolute against attack from outside their family.

THE SPLENDID WORK OF THE LINNETS IN FREEING THE FIELDS OF WEEDS

In happier days, before waste lands were scoured by bird-catchers, one used to see the lovely Goldfinches, ornate with red, yellow, brown, black and white, flocking like the siskins wherever seed was to be gleaned. At one time it seemed as if these precious birds would pass from the list of wild things; but the protective acts have saved them, and their numbers now grow from year to year.

Linnets, too, are very numerous in Europe, and never so hard pressed by human enemies as the goldfinches. They are delightful little creatures, especially when part of the plumage is flushed with pink, a color which the caged bird always loses. They are eaters of weed seeds, and do invaluable work in freeing the stubble fields of injurious growths. Their nearest kindred, the Redpolls, lack the song which glorifies the linnet, but they are very trim, handsome little birds, whose nests give a romance of quiet but busy life to our hedgerows.

THE FAMILIAR BIRD OF WHICH WE HAVE A THOUSAND TIMES TOO MANY

Coarsen a linnet or larger redpoll and we have a fair imitation of the Sparrows—allied forms, yet how different. There are many sparrows: Rock Sparrow, Tree, Black-breasted, Spanish, and a beauty in sober raiment which we call a Hedge Sparrow, though it is not really a sparrow at all. The English Sparrow is the one with which we are all most familiar, and it needs no describing. This bird is a problem in feathers, and nearly as troublesome as the rat.

The destruction of birds of prey has enabled it to increase beyond all reason. A thousand sparrows may be a blessing, but we have a thousand times too many. They devour our grain; they drive away better birds, such as the delightful, beneficial swallows; they damage property with their hideous nests, and cause roofs to flood and walls to reek with damp.

Clubs are promoted for the destruction of sparrows, with the result that any killable bird becomes a sparrow for the sake of reward, and goldfinches and other gems come into the slaughter. The sparrow puzzle will have to be treated scientifically one of these days. At present the bird is a nuisance at home and in every land to which it has been exported.

SOME INTERESTING MEMBERS OF THE FAMILY OF FINCHES

The Serin Finches would be welcome in Europe in place of the superabundant sparrows; but, common to Southern Europe, they come not in battalions but as

single spies to southern England. Their closest ally is the Canary. For centuries these finches have been bred in cages and the fanciers have expended not less care upon them than upon pigeon and poultry. We have endless varieties of size, color, shape and song. Those who have never heard the nightingale may find in a golden-throated canary the nearest rival of that kingly bird. The long, sobbing succession of notes in which a canary warbles down the scale is a good imitation of nightingale music in one of its phases.

Rose Finches, lovely in their scarlet; Purple Finches, which are ruddy red

Photo, courtesy A. A. Allen.
Male Indigo Bunting feeding young.

rather than the hue of their name; Desert Finches, which thrive and sing sweet songs in dismal wastes; Bullfinches, which have but a monotonous pipe when at liberty, yet learn whole tunes when taught in captivity; Pine Grosbeaks, which rend the seed from the pine's tough fruit; Crossbills, which have the two halves of the beak crossed at the tip, and rive the seeds from the overlapping scales of the pine cone; Scarlet Finches, Red-headed Finches, and the unique finch restricted to the island of Laysan in the Pacific, are other notable members of the interesting and widespread family of Finches. And now we pass to another subfamily, the Buntings, which includes some very interesting small birds.

There is something very admirable in the Snow Bunting. Its home is in the mountains of the North, and it had been thought that it came only as a migrant to Great Britain, but one day in the Eighties a man seeking ptarmigan in the Scottish hills heard a bunting note when buntings were not supposed to be there. He searched as for rare gold and found a prize. There was a nest containing, not ptarmigan, but ptarmigan feathers as a couch for five baby buntings whose sire had gone a-hunting.

THE BABY BIRDS THAT RUN BEFORE THEY CAN FLY

Since then many snow bunting nests have been found among the Scottish mountains. This, however, does not detract from the general law that snow buntings go north, to the home of snow, to make their nurseries. They are, indeed, the most northerly birds of all our *little* featured adventurers. The Lapland Bunting, remarkable for its immense hind toe, goes as far north, but keeps to the upland swamps rather than to the heights favored by the daring snow bunting; but it is known well in England and North America as a winter visitor.

A well-known English bird is the Reed Bunting, which country people call the Reed Sparrow. The bird nests low in reeds or tussocky grass near rivers and lakes, or on the edge of marshes—very safe places from all but those who do not fear mud and muck in their hunting for eggs and nestlings.

Even if found, the baby buntings of the reeds can run and hide, though they cannot yet fly. They jump out of the nest and run silently among the dank herbage of their retreat, agile and clever as baby rails in a field of summer grass. They will do well until all marsh is drained and river banks are made intolerable by the press of human feet.

THE BUNTING THAT SANG TO THE POETS OF GREECE AND ROME

The little bunting has a voice of melody for the grim spaces of the great Arctic; the Corn Bunting keeps near man in order to glean the grain spilled by his careless bounty in his cornfields; the Black-headed Bunting, common in Eastern Europe, rarely drifts west of the European mainland. Its natural setting, however, seems a vineyard, or some fair scene where pomegranate, olive and almond illumine the beauty of the ripening grapes. Sweet of song, dainty of build and feather, this bunting must have

ALL IN THE DAY'S WORK OF A BIRD

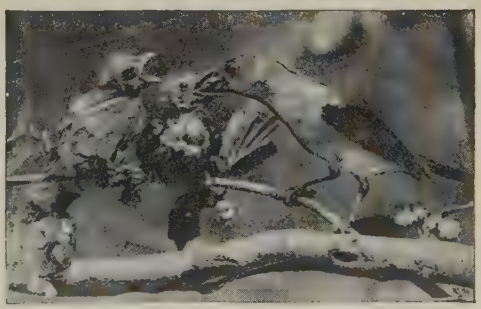
Song Sparrow and White-throated Sparrow.

Tree Sparrow in winter.

Baltimore Oriole and its nest.

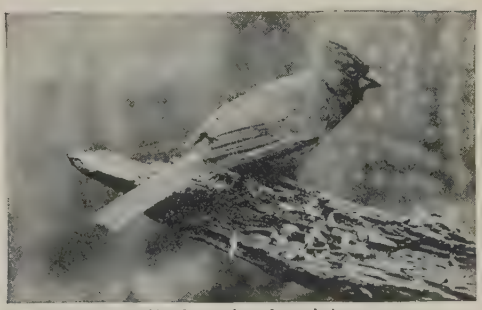
Rose-breasted Grosbeak at nest.

Chipping Sparrow feeding young.



Scarlet Tanager feeding young.

Bobolink with worm for young.



Cardinal on log in winter.

Pictures on this page are from photographs by A. A. Allen.

inspired many a poet of classical Greece and Italy in the great days of old.

There are two buntings distinguished by their yellow hue. We are not likely to confound them, for the Yellow-breasted is a common Siberian species, whose songs the bitter winter cannot quite mute. The other is the true Yellow Bunting, called Yellow Hammer in England. We call a woodpecker by this name.

A beauty, chestnut and yellow and finely penciled, the yellow hammer is an extraordinarily elusive bird. Two in a large open-air aviary used to call the livelong summer day to the skies, and sometimes a third voice would answer from without. Now, though the owner heard that duet or trio hundreds of times, he was never able to discover the bird in freedom from which the response to his own pets came. The callers must have been close at hand, yet they were beautifully screened, thanks to the resemblance of their mottled plumage to the branches and foliage of trees on which the sunlight played.

A more elegant bunting than the chiming treasure is the Cirl Bunting, a fugitive in southern hedges more often heard than seen. Its nearest relative, the Ortolan, appears in Europe more frequently at table with trimmings than at large. It is incredibly numerous in certain parts of Europe, and it is so tame and easy to catch that it is netted in flocks, kept in miserable captivity, fed on crushed oats till monstrously fat, then eaten.

There are other buntings, the Meadow, the Crested, the Sparrow Bunting; buntings peculiar to America, to parts of America, to Africa, and so forth. The most famous of the remainder is, perhaps, the Indigo Bunting, an American of many tints, with a lovely blue pervading the whole. It makes the bird when seen in certain lights appear a living thing of indigo, though brown, light blue and green are also in the color-scheme. It breeds from Canada to Central America. The Lazuli Bunting, common in the West, is similar, but the male has a white breast.

The birds of this chapter are not so gorgeous as those described in the one before, but they have more song in them. We have a wider diffusion through many lands of the real beauty birds of the group. We could not spare a single species of the ornate Crow tribe, nor could we afford to dispense with the present assembly. However, it would be reasonable to limit the numbers of certain of our present species.

The Green Hangnest.

The Long-tailed Whydah.

As in a well-ordered household, so in nature there is a place for everything, and we should not thwart Nature's efforts to keep everything in its place. We smash a precious living link when we destroy the fighting birds, and the consequence is a plague of sparrows everywhere, and starlings numberless as the sands of the seashore.

We should be better off with fewer of some of these birds, but each species in reasonable numbers is precious to us all, for song, for service, for company. These lovely life-forms gladden our lives in the towns and in the country—in the cold places of the North, the hot places of the South, and in those sterile wastes where the heart would faint without some touch of beauty and some sweet sound of music. As a rule, sober-suited birds are the best songsters.

THE NEXT STORY OF ANIMAL LIFE IS ON PAGE 3129.

Sir John Franklin.

Sir H. Willoughby.

Henry Hudson.

Martin Frobisher.

Sir E. Belcher.

Sir John Ross.

Sir J. Clark Ross.

Sir E. Parry.

Roald Amundsen.

Otto Sverdrup.

MEN OF THE NORTHERN SEA-GATES

CONTINUED FROM 2850

A THOUSAND years ago Alfred the Great listened to the story of the first recorded Arctic expedition. Ohthere, who dwelt "northmost of all the Norsemen," had so strongly within his heart the passion for discovery that he could not sleep for thinking of what the unknown North might hold. So he gladly left his herds of six hundred reindeer and his other riches, and pushed on north and east till he found the White Sea and the Dwina River and the North Cape.

On his return he told the king of the wonders he had seen. The king must have doubted the description of the huge, fat walruses and their "noble teeth." But Ohthere, to prove the truth of his story, held out the walrus-teeth he had brought as a present to the Saxon king, and Alfred was convinced and wrote down the story Ohthere had told him.

Ohthere spoke of the natives he had found so unfriendly near the mouth of the Dwina. Unpromising as is the country stretching up to the frozen polar sea, there were then, and are now, men, women and children who live scattered over the wide and dreary expanse, belonging to a very old family of nations—poor relations, we may call them, of the Chinese. Most of them are Eskimos, or Innuits, and these are found chiefly round about the shores of North America and the islands. Other tribes of the same family live on the desolate tundras of Asia, which are frozen hard during the winter and form a swampy morass during the summer.

It is difficult for us to imagine their life. No fruits, no vegetables, a little moss; but no trees, no cornfields, no towns, no way of getting about except in small boats made of skins, or on sledges drawn by dogs or reindeer. For food, clothing, oil to give light and heat, they depend on the seals, walruses, bears, whales, foxes and fish that share the Arctic solitudes with them.

In winter when the sun does not rise for months, they live in round houses, like basins upside down, built of blocks of frozen snow, which thaw as summer appears. And such a summer! For the sun, once up, stays up later and later till he does not go to bed at all. Then they take to tents or shelters of earth or stone.

In a gallery of the Museum of Natural History in New York we can see many things that help us to enter

into the life of the most northerly people of the world. There are their fur dresses; the women wear trousers as well as the men, and the little girl's suit is particularly interesting, as well as the waterproofs, boots and mittens.

The canoes—the small one is, perhaps, a woman's—we can fancy being paddled in the dark water. The difficulties of the chase are brought home to us as we look closely at the spears and darts to kill seals and birds, at the fish-hooks and harpoons, at the whistles for luring the deer, at the bows and arrows, and at the ice-scratchers to attract the seals.

THE MEN WHO PUSHED INTO THE UNKNOWN NORTH

Though the Eskimos are interesting, men have gone into the frozen North for other reasons. Whalers at all times have sailed in search of the oil-giving monster, and have added little by little to the knowledge of northern coasts; and following Ohthere, many brave Northmen visited Greenland, Iceland and the surrounding islands and coasts. Others have sought a passage from ocean to ocean, the Northwest Passage of which you have read so much.

The main land masses of the earth lie stretched from north to south, barricading the way from east to west. North and South America span almost the whole distance between the icy Arctic and the blizzard-swept Antarctic. Europe and Africa, without a break before the Suez Canal was cut, made another solid block from the Arctic to the stormy South Atlantic. But the desire of man has always been to cross by the milder climates, if it could be done, from east to west, or from west to east.

Surely there must be some easier way, or at any rate some other way, than the long southward track round the southern capes that tip America and Africa. How much nearer it would be if only man could sail the northern edges of America or of Asia between the keener nips of wintry weather!

THE ROMANTIC SEARCH FOR A PASSAGE LINKING EAST AND WEST

Those short cuts between East and West have haunted the imagination of seagoers ever since Columbus headed for India and found America. Nowhere else on the earth has there been such adventure as in the attempt to link East and West by a northern passage.

The imaginations of men were on fire with yearning to reach the East, whence came spices and silks, gold and perfumes, ivory and gems.

The men of the age could not send forward their minds into the future and see America with 120 million people in its northern half, the richest land on the earth. To them a little ship not too rotten to get out and home with a cargo of pepper was of greater consequence than any possibilities of the new continent. Trade and adventure ruled them.

Columbus failed to get past America, his fancied East in the West, and John Cabot tried as vain a venture. We must pause a moment in his company, for he was as typical of those marvelous times as Columbus himself. Like the mighty pioneer, John Cabot was a native of Genoa and became a citizen of Venice. He had three sons, and their life in Venice recalls to us the picture of Marco Polo in a similar setting.

THE DREAMS, PROJECTS AND VOYAGES OF JOHN CABOT

John Cabot reached England in 1490, settling at Bristol, which was then England's greatest port looking out to the West. He was a man like Columbus, inspired by the same dreams of what lay beyond that great ocean over which his eyes were ever straining. The same hope surged in his blood. He thought of reaching wonderlands, the East through the West. He believed there were fabulous islands of enchanted ease and riches; he believed all the old fables of lands graced by seven perfect cities, countries where corn grew untended, realms of wealth and bliss to be had for the seeking.

Before Columbus sailed on his first great voyage Cabot had made expeditions to the West to find, not the Indies, but some fabled island of Brazil. No land, however, was discovered.

Henry VII might have had Columbus and his feats to glorify his reign. He did indeed consider the project which the brother of Columbus was sent to lay before him; approved it, got together money to pay for the expedition, and spent it on tapestries to decorate Hampton Court Palace. When he heard of the success of Columbus, however, he took counsel with John Cabot, was persuaded that the true East had not been reached, and sent his Genoese adventurer to seek it by way of a northwest gate.

WILLIAM BARENTS IN HIS LITTLE HOUSE

William Barents writes his diary while held up for the winter in a little driftwood hut on Nova Zembla.

THE ADVENTURER WHOSE NAME WAS GIVEN TO AMERICA

It was an age in which some men did great things and others pretended to have done greater. The claims of Amerigo Vespucci, who declared he had made voyages which we know to have been impossible, won for him the false honor of having the New World called after him, and not after its real discoverer. Sebastian Cabot, a son of the great John, was just as untruthful, and wrote histories of voyages he never made, or made under the command of his father. So the feats of John Cabot have been denied something of the lustre they merit.

But one fact is clear as the noonday sun. John Cabot sailed in 1497 in the attempt to miss the New World and reach the Old, and, instead of doing so, he discovered North America. Apparently he touched at Newfoundland. That or Cape Breton Island must be the new island for which the king rewarded him with ten pounds.

More and more of the coast of South America was revealed in successive voyages, and the coast-line from south to north appeared endless. Eleven years had enabled Vasco da Gama to round the Cape of Good Hope which Bartholomew Diaz had found, and India was reached by sea. But the westward way to the same treasury of riches seemed shut off completely by the continent standing in the way. Surely, men thought, it stretched from Pole to Pole.

Magellan's grand voyage, thirty-eight years after Columbus' first, showed that there was a way through the South, but he had had to sail ninety-nine days after clearing the dreaded strait. Not for another half-century did anyone seriously attempt to follow in his wake. Then Francis Drake sailed round the world in his Golden Hind. One great thing he proved in that voyage, and another he attempted.

THE TEMPEST THAT DROVE FRANCIS DRAKE TOWARD A GREAT DISCOVERY

Caught by a storm as he sailed into the Pacific from Magellan's Strait, Drake was blown fast and far southward beyond Cape Horn, and found open sea at the foot of the southern end of the continent, so establishing the fact that America does not reach to the South Pole. Drake returned thanks to God for the tempest and its consequences, regarding it as a sign from heaven directing him to his great discovery. Then, having filled his ships to bursting with treasure snatched from Spanish ships off Chile, and fearing reprisals if he returned by the way he had come, he calmly steered north to round America and sail home to the east.

That was the first attempt at the Northeast Passage from the Pacific. Daring Drake was balked in his endeavor, not by the actual dangers and difficulties, but by the fears of demons and supernatural perils which his crew believed to exist in those high latitudes. Drake therefore struck out across the Pacific and rounded the world in order to get home, as if it were an everyday yachting cruise.

THE WILL-O'-THE-WISPS WHICH HAVE LURED MEN ACROSS THE SEAS

Romance and fire and knight-errantry of the sea were in all this wondrous pirate did, but superstition had a firm hold on the men who sailed where Columbus had led. Eternal youth and the realms of the blessed were among the will-o'-the-wisps which lured men across the seas. There was, however, also a more substantial bait. Cabot in his voyage had discovered a coast whose sea seemed almost solid with fish. Generations of men braved the horrors of the broad Atlantic to gain distressful rewards from catching the fish and selling them salted at home, where food was never quite enough for the mouths it had to feed. Dangerous little ships they were that sailed, often with their bursting timbers bound together with ropes; half-decked, with open skies for the crew or damp, reeking kennels in which to screen themselves a little from wind and water.

THE HARDSHIPS ENDURED IN THE ROMANTIC SEARCH FOR TRADE

Every disease which can come to badly fed and housed seamen struck at those early sailors of the Newfoundland trade. Yet the hardiest survived and bred a matchless company. The smallness of the ships made many captains and navigators necessary. The wealth they earned, the trophies they brought, the stirring tales they told, all helped to create schools of sailors such as have never been excelled.

These were the days of the so-called Merrie England whose praises are so often sung. It was an England so merry that men ventured out in ships like floating coffins to have a few pounds to keep them and their families from the pangs of

THE PEOPLE OF THE GREAT WHITE NORTH

The people of the great white North live much the same to-day as did primitive man thousands of years ago. They are barely civilized, and dwell in rude huts. We see here Laplanders at home.

In summer the Eskimos live in tents made of sealskins sewn together with bone needles and animal sinews. In winter they build snow huts.

*This picture shows an Eskimo hut made of stones and earth. The cold of the climate will not allow trees to grow, and consequently wood is very rare.

*As a rule, the Eskimo women, some of whom are seen in the picture, dress in the same way as the men. Their clothing is of sealskin.

*This is the summer home of a family of Laplanders. The dog shown in the picture will be used, with others, to haul a sledge in the winter.

*© Underwood & Underwood, New York.

starvation which smote the land each winter.

And it was trade, not glory, which inspired the men who sailed those mad little vessels. All geographical adventure of that great age had trade for its mainspring.

Trade dictated the ventures to the northwest gates, and as these failed, London merchants formed themselves into a company and sent out, in 1553, a little fleet of three tiny ships, to find a way to Asia by the opposite way—to find a northeast gate.

The expedition was commanded by Sir Hugh Willoughby, with whom were Richard Chancellor in a second ship, and Captain Durforth in a third. It was a memorable day for London when the little fleet sailed down the Thames.

THE DOOMED KING'S FAREWELL TO THE ADMIRAL WHO WAS ABOUT TO DIE

King and court turned out at Greenwich to wish it godspeed. The admiral who was about to die saluted the king, young Edward VI, who was about to die. Flags fluttered, guns fired, and the tiny ships passed on. Before long the boy king was in his coffin; in six months the gallant Willoughby was frozen to death with his entire company.

The three vessels turned the North Cape, which was named on that voyage, and in our high summer they found themselves in wintry conditions of unexpected horror. The vessels were blown away from each other. Willoughby was frozen in off the coast of Lapland. There, unprepared for conditions so terrible, he and his men froze to death in their floating home.

They were found three years later just as they had died: the men in various parts of the ship, Willoughby still seated in his chair in his cabin, papers about his table, his diary open before him, recording, as his last entry, that "strange beasts, to us unknown and also wonderful" were roaming about the ship.

Such was the first search for a northeast gate from a home port, and so the long, agonizing roll of suffering and death opened. But there were good results for commerce as well as bad blows at the heart. For Chancellor, all unconscious of this tragedy, found his way to the White Sea, wintered where Archangel now is, made a sledge journey to Moscow, founded a great trade between England and Russia, and paved the way for a thriving trade with Persia.

THE ATTEMPTS OF FROBISHER TO FIND A NORTHWEST GATE

An opening by the sea appeared not to exist that way, and so, after a lapse of another forty years, that kindred spirit of Drake, the valiant Martin Frobisher, tried the northwest again. The farthest point he ever reached was Labrador. But how splendid, how incredibly dashing, were his three attempts!

He went up into the raging North, amid icebergs and ice-sheets, in ships of which the greatest was a 20-tonner. He commanded thirty-five men, but they were distributed over three vessels. China, golden sunlight and golden treasure were in his dream, and he did not mind if he had to sail over the North Pole to get it. But all he gained was a lot of useless ore, supposed to be gold, from an island in the North. The discarded tusk of a narwhal which he brought home was regarded as the horn of a unicorn, possessed of magic properties and therefore a fitting gift for Queen Elizabeth.

In place of the stately grandees of China of whom Marco Polo had written, Martin Frobisher found the first Eskimos he had seen, and brought home one as a marvel to match his tusk. But it was not the fault of the Eskimos that he came home at all. They were as much amazed at the sight of him as he was at them. They baited hooks with sea-meat and threw them into the water as a lure, hoping to catch him, like a strange, great fish.

THE HARDY FISHERMEN WHO WON THE FREEDOM OF THE SEAS

Frobisher and Drake had, after this, more vital concerns than exploring, for their country was threatened with a sea attack by Spanish ships. Cabot's discovery of fish off the Newfoundland banks had called into being a body of men who now, with Drake and Howard and Frobisher at their head, were able to sweep the Spanish Armada from the seas.

But a great figure, of whom we hear less than we should, was roving the wild seas, both before and after Armada days. It was John Davis, who was sent northwest three times, beginning when he was about thirty-five, in the year 1585. Greenland, where Eskimos and Vikings had

mingled, had been lost to knowledge for a century and a quarter, but John found it again. Approaching it from the east, he sailed south, rounded Cape Farewell, and sailed north and left it far behind, sighting green islands and fair sea.

A second and third time he went, and at the third attempt he reached what is now called the Davis Strait after him, washing the western coast of Greenland and linking Baffin Bay with the Atlantic. As far as 73° North Latitude sailed he. And though he was fated to be murdered in Oriental waters, reached by way of the Cape, he left sailors a hope and an illusion.

JOHN DAVIS AND HIS MISTAKEN IDEA OF THE NORTH POLE

The open waters of summer encouraged him to declare that the seas to the north were free of ice, that such swift seas could not freeze, and that if someone pressed far enough he should find an excellent climate and a people at the North Pole superior to all others, through the enjoyment of perpetual light "by the benefit of twilight and full moons."

A tremendous character was Davis, first of the long line of true Arctic men. He wrote admirably of his voyages, and his books had an enormous following for generations after his own day.

The next outstanding figure was the Dutch William Barents, whose countrymen were powerful at sea at the time, and as anxious as the English were to find the short ocean route to the East, where they had great possessions. Barents, in a fine voyage beginning in 1594, sailed 1,700 miles, in which he turned his ship about no fewer than eighty-one times, made accurate observations, and fixed his latitude. Sailing north a second time, he discovered Spitsbergen, but taking it to be part of Greenland, he turned about to Nova Zembla, and was frozen in, the first expedition to survive winter in the Arctic since Viking days.

It was a terrible and wonderful time. They built a hut of driftwood, with a cask for a bath, a chimney through the roof, and plank beds for eighteen men along the walls. Snow buried the hut, and bears tried to tear open the roof, but the men climbed up the chimney and fought them off. Blue foxes served for food and clothes, but the ice was "two fingers think" inside the hut. The fire in the stove had no effect upon this ice.

WILLIAM BARENTS AND THE SIXPENCE HE PAID FOR NOVA ZEMBLA

When spring came and his ship remained fast, Barents ordered his men into the two boats they had. He died, a quiet and uncomplaining hero, on the voyage home. Barents was a fine sailor, a scholar, and a cheerful soul. Wanting to claim new territory for his king, he nailed up a cross with a sixpence bearing the king's likeness on it. That and Dirk Hartog's soup plate nailed up on the shore of Australia (of which we read on page 860) must be among the most curious of all the title deeds on record.

In 1871 another polar explorer, Captain Carlsen, rounding the northeast point of Nova Zembla, saw a hut standing, and in it he found the captain's room, with a clock in its place on the wall, and everything as it had been left 274 years earlier. Four years later another searcher in the hut discovered part of the diary Barents had written.

Barents was an early victim of the Northwest Passage. William Baffin, a humble Londoner who mysteriously obtained a wonderful education and knowledge of seacraft, and made himself one of the greatest of Elizabethan seamen, was the next adventurer. He made voyage after voyage, farther and farther north, teaching the seventeenth century all it knew about the magnetism of the earth, giving his name to Baffin's Land, and pointing a passage to the North Pole by which the discoverer of the Pole actually went.

But Baffin was always trying to get to China round the north of Canada, and he failed; he failed gloriously, dying heroically in the Persian Gulf, where he first won English influence.

THE PATHETIC FATE OF HENRY HUDSON IN HIS LITTLE BOAT

Henry Hudson's thrilling endeavors to reach the coveted goal by way of these frigid waters brought everlasting fame to him. The great bay which immortalizes him and keeps green the memory of his tragic end, had no bearing on the channel he sought. But the mutiny of his crew, who turned him and his little son adrift in an open boat to perish on the waters, stirred public feeling deeply, and led to further effort.

Yet for more than two centuries no other man equaled the feats of these whose names we have been considering.

There seemed no way through to the North, and Baffin's feats would have gone unchallenged to the crack of doom had not later generations determined that they would not obey circumstances but rule them.

As the sea was so hostile, the problem of a northern way round was attacked from the land. The northern limits of Asia were traced on foot, and hunters tracked out much of northern Canada, where the name of Mackenzie, a brave pioneer, was bestowed on a great river.

Knowledge was added year by year as the outcome of cruises in pursuit of whales and seals and the demand for furs lured men farther and farther into the wilds of Siberia.

THE TREMENDOUS PREPARATIONS FOR THE GREAT VOYAGES OF BERING

The most astounding expedition of the age was that of Vitus Bering, a Dane, who was attracted to the service of the Russian tsar Peter the Great. In 1724, when forty-four years of age, he was bidden by his master to ascertain if there existed a channel between Asia and America, or whether, as was thought, the two continents were one. Simon Deshinef had reported in 1648 that a great sea of water rolled between the two lands, but no one could confirm the story and so all denied it, as other facts have been denied.

It was an unparalleled effort, lasting over sixteen years and including four overland journeys of 4,000 miles each between Petrograd and Okhotsk in Siberia, for practically all material had to be carried from Europe to this remote point in Asia. It cost tens of thousands of pounds and hundreds of lives. To supply the wants of the many men who partook of Bering's labors, reduced the food supply of all the native tribes along the Siberian coast with which the Europeans came in contact.

The first expedition comprised five hundred men—scientists, sailors, carpenters, blacksmiths—and eight hundred horses, drawing an immense number of wagons. Yet supplies ran short, and men had to eat their boots and the harness of horses before all assembled at Okhotsk at the end of eighteen months. It took three and a half years from the time of starting to build and launch the first ship, and the actual voyage of exploration lasted seven weeks.

THE SAD END OF THE HEROIC BERING AFTER MANY YEARS OF LABOR

Bering found open water where the land connection between two continuous continents should have been, but he did not sight the American shore before being driven back to winter quarters. Another attempt in the spring found the weather still against him, so he returned to Russia after five years with little to tell. But he was sent out again in 1733, and he dispatched ships to find Japan, which they did. This expedition consumed so much of his stores that nearly eight years elapsed before he could again set sail to find America.

This poor discoverer did at last find America, but he never came home to tell the tale. He was blown away by storms while attempting to return to Kamchatka. When his men were so reduced by scurvy and starvation as to be unable to work the ship, wind and waves carried the vessel right over a great gap in a reef on to the desolate shore of one of the Commander Islands.

There they wintered under upturned boats which were made to cover sandpits. There was enough meat for the killing —sea-otters and seals. But there were myriads of Arctic foxes that stole their food, carried off their clothes, gnawed the dead and nibbled the dying.

There the unhappy Bering perished miserably in his tent, mad with privation and the diseases which hardships had engendered. His name was given to the island on which he died, but it is certain that the foxes must have had his poor, wasted body. Bering Strait is his everlasting memorial on the map, placed there by the reverent admiration of Captain Cook, who followed where Bering had led. Captain Cook gave the title of Cape Prince of Wales to the most westerly extremity of America, and East Cape to the most eastern point of Asia.

THE GLORIOUS FAILURES OF CAPTAIN COOK TO FORCE A NORTHERN WAY

But Captain Cook, with all his courage and science, and with all the art by which he, more than any other man of the age, kept his men in health and heart, could not force a passage either to the east or to the west from Bering Strait. It will always require luck to do so, the luck of the warm season, the luck of the precisely right moment at which to strike through.

THE MAN WHO WOULD NOT BE OLD

Something being said about his age, Sir John Franklin reminds the admiralty that he is "only fifty-nine," and is accepted to lead the expedition to the Northwest Passage.

In 1776 the British Government offered a reward of $25,000 to anyone who could pass beyond the 89th parallel, not to the Pole—for that goal was not yet contemplated—but as a means of finding this long-sought gateway. William Scoresby, a glorious name in sea annals, the greatest of all the whalers, and a scientist and writer, did not gain the prize, but he crossed the 81st parallel in a superb voyage of 1806. He gained further renown along the east coast of Greenland in 1822.

Throughout the days of Napoleon's power exploration ceased, and it was not until after 1815 that the ordeal of braving perils in the unknown was resumed.

THE CLOUDS WHICH MEN IMAGINED TO BE A BARRIER TO THE WEST

Renewed exertions by Sir John Barrow in 1818 stimulated ardor afresh. Then a prize of $100,000 was added to the original $25,000, and three grand figures in succession appeared on the scene. The first was Sir John Ross, a Wigtonshire Scot, who sailed north in 1818 on the ancient quest, taking with him his nephew James Clark Ross and William Edward Parry, both of whom also won fame.

Exploring the bay which honors Baffin, he found it was no bay but a sea 800 miles long and 280 miles broad, and often frozen over. Failing to progress to the north, he turned west into Lancaster Sound, and there committed a mistake which embittered his whole heroic life.

Before him was a veritable gateway to the New World, but it was obscured by clouds. He thought these were mountains, named them the Croker Range, and came home and described them as an impenetrable barrier to the west. Parry disputed his chief's theory, and the Admiralty eventually sent him north on his memorable series of voyages, three for the northwest gate, and then on the first expedition aimed at the North Pole.

Parry gained the $25,000 prize. He penetrated beyond Lancaster Sound into Barrow Strait, which broadens into Melville Sound. He passed over the Magnetic Pole, and when held up by ice, made a land journey which revealed at last open sea leading toward Bering Strait.

THE DRIFTING ICE WHICH CARRIED AN EXPLORER AWAY FROM HIS GOAL

The way was found, but Parry was not to sail it. He was barred from it by ice, as Cortes was barred by land from the Pacific when he first viewed it from a tree-top in Darien.

Parry's sledging and sailing trips were full of thrilling adventures, perils from ice and shipwreck, and nightmare experiences. They drifted south on the ice during the night farther than his men were able to march north in the day. Here was explained, for the first time, one of the terrors which had filled older seamen's thoughts with fear of demons. They found their ships blown north, while bergs and ice-sheets drifted in the opposite direction down on them. They could not know, as Parry did, that currents carry ice even against the wind.

Parry's shipwreck was a godsend in disguise, for he got his men back in safety, and it was from the timbers and stores of the wreck that Sir John Ross, eight years later, saved himself and his crew when his own vessel was lost in the pitiless ice. Ross's second voyage covered four years, with fruitful result, notably when the faithful nephew, James Clark Ross, charted the position of the Magnetic Pole.

Now was to come the crowning tragedy of regions rich in brave men's agonies—the tragedy of the Franklin expedition.

Sir John Franklin, born in 1786 at Spilsby in Lincolnshire, England, was well educated, a warrior, scientist and statesman, animated by a courage which flames highest when the heart is hardest tried. He fought as a boy at the battle of Copenhagen, and five years later he won laurels at Trafalgar. He was with his uncle, happy Matthew Flinders, off the Australian coast. He helped the Greeks in their war for independence, and he was an inspired governor of Tasmania. But it is for his Arctic explorations that he lives in fame.

Under Captain F. W. Beechey he first sounded the deeps of Spitsbergen's waters. Then, in a journey lasting between three and four years, he explored the mysterious coast-line of America's farthest north. His journey covered 5,500 miles, and embraced the Coppermine River and a great stretch of coast. A second land expedition revealed the secrets of the Mackenzie River, and the coast up to near the 150th meridian.

For this second journey of Franklin's Captain Beechey was sent by ship round from the north to sail east and try to join

hands with Franklin as he pressed northwest. Only fifty miles separated the parties at the close, but ice prevented a meeting.

The story of those two trips would fill a volume; appalling cold, months of starvation, the expedition broken into small detachments raging with hunger, with a frightful Indian guide turned cannibal secretly killing the men of one detachment.

Another sixteen years passed, and then came the great expedition of 1845 to find the elusive channel or perish. Franklin offered his services, but the Admiralty mentioned his great age. "Sir," said the old lion, "I am but fifty-nine," and, so saying, he was accepted. He led forth, in the Erebus and Terror, the best-equipped expedition that had ever left English shores.

Sir William Edward Parry's expedition in search of the Northwest Passage in 1819.

The ships might have been manned entirely by naval officers, so many were the volunteers, but that could not be. As it was, the 129 officers and men who composed the company were an aristocracy of efficiency and character.

Franklin's instructions were to follow the route from Fish River to Bering Strait. He did, and with all his little host he perished on the way. But he forged the key to the passage. He got to a point west of that which had been reached by Frederick William Beechey sailing in from the opposite direction in the first quarter of the century. All else is mystery. After having been seen by whalers in July, 1845, in Baffin Bay, the two ships vanished. The secret lay only with the Eskimos, and with them it rested for years and years.

The first three years caused no special alarm, but after that search parties began to stream out to seek the lost legion. The British Government offered $50,000 for definite news of the fate of the expedition, and $100,000 for its rescue. For ten years the search lasted, and thirty-nine expeditions sailed on the hopeless quest, at a cost of over five millions of dollars.

Little by little the dismal story was pieced together from what Eskimos told and from relics which were discovered. We know now that the two ships were seized by ice in McClintock Channel and drifted some thirty miles in two years. A single scrap of writing was found in a little cairn at Point Victory, dated April 25, 1848, and stating: "H. M. Ships Erebus and Terror were deserted April 22, five leagues N.N.W. of this, having been beset since September 12, 1846: officers and crews, 105 souls, under the command of Captain Crozier, landed here. . . . Sir J. Franklin died June 11, 1847. The total loss by deaths in the expedition has been to this date 9 officers and 15 men." This was signed by Captain Fitzjames and Captain Crozier, who added the words: "And start to-morrow, 26th, for Back's Great Fish River."

That is all. For the rest there were tales told by Eskimos of gaunt men dragging boats from foundered ships across the starving land, begging a little seal

meat to keep them alive. One old Eskimo woman drew in the sand pictures of two ships to show that she had seen them, and told how the men dropped dead as they walked.

Many relics came to light; isolated corpses, some by the wayside, some in upturned boats, some in tents, with guns in their hands loaded to shoot the game which was not there. There were shot and powder and scientific instruments; there were the tracks in the snow the men had made; gloves spread out to dry after washing. Worst of all, at the last camp of death, were the evidences that the poor maddened survivors had been driven to cannibalism before they died.

Franklin's last voyage was the worst and yet the greatest. He got through to the point at which a ship from the west had sailed to the east, and the channel was proved. From every experience, however ill, there is some good to be extracted if men diligently seek it out. The tremendous new impetus which the Franklin disaster gave to exploration really opened the ways east and west.

Adolf Eric Nordenskiold, who first sailed through the Northeast Passage.

It was the eastward way which first yielded, and it yielded to Adolf Eric Nordenskiold, who, born at Helsingfors, Finland, in 1832, was driven by political persecution to become a Swede, and to give his adopted land the glory of his work as scientist and explorer in the North.

The harvest of reputation which so many had died to gain came easily to him. After two fine voyages along the north Asian coast to the Yenisei, he proved that the Kara Sea was navigable at the right season. In the years 1878 and 1879, though held up in the ice for 264 days in sight of victory, he got out. At last, on July 18, 1879, he sailed through the Bering Strait and away across the ocean to Yokohama. Nordenskiold thus wrote the sequel to a story begun 326 years before by the expedition which carried Hugh Willoughby to his death.

The Northeast Passage was finally won, and the Northwest Passage surrendered its secret in 1906—to a Norwegian, that favorite of fortune, gallant Roald Amundsen, who was later to snatch the reward for gaining the South Pole.

Amundsen sailed in a little 70-footer from Christiania, Norway, in the spring of 1903. Pushing west by routes sanctified by the lives of his British predecessors, he followed in the wake of Franklin and went beyond: across Baffin Bay, through Lancaster Sound and across Barrow Strait, down to Peel Sound, along the De la Roquette Islands, past the magnetic North Pole, then east of King William Land, with men sounding the uncharted waters the whole time.

By the middle of September he was west in Simpson's Strait, and there he anchored in safety for the winter. Two years he was detained here. On setting sail in August, 1905, he had only got to King Point in Mackenzie Bay when winter stayed him again. While his ship was thus detained Amundsen with a sledge party traveled 1,500 miles overland to Eagle City in Alaska.

Returning to his ship, he got her out of the ice again by the summer of 1906, and after a thrilling passage of 1,100 miles he passed out of Bering Strait on September 1, 1906, and put into Nome, conqueror of that Northwest Passage which John Cabot had vainly sought to find more than four centuries earlier.

So, at last the two enchanted ways were laid open and their mystery solved. For four centuries men had tried to get through. Now there remained nothing to be known save that the ways, though mastered, were hopelessly impracticable.

Nordenskiold had to winter to get east; Amundsen had to spend three years in completing his perilous journey from east to west. But the old quest had been at last gallantly achieved. Neither route is the short cut to fortune; both are the highway of agony, peril and death.

THE LAST RESTING-PLACE OF SIR JOHN FRANKLIN'S COMRADES

THE LAST DAYS OF FRANKLIN'S MEN

Yet these sufferings have not been useless. The men who sailed to the northern sea-gates brought back knowledge of climate, animal life, sea-currents, geology and Arctic peoples. From their observations it is now known that coal and iron are to be found in the Far North. From fossil wood discovered on some of the Arctic islands it is evident that once upon a time the climate of this region was much warmer than it is now. Perhaps this knowledge will be more useful later on in the world's history than it is at present.

THE NEXT STORY OF MEN AND WOMEN IS ON PAGE 3085.

SOME OF THE SPICES WE USE EVERY DAY

Nutmegs ready for gathering.

Chinese Giant Capsicum.

Pungent Black Mustard.

Pepper with the ripe berries.

An Allspice or Pimento tree.

A pepper plantation in British Malaya.

THE SPICE PLANTS

CONTINUED FROM 2913

THE spice plants, which yield the pungent and fragrant substances used all over the world as condiments, are almost all natives of tropical regions. Though they now grow East and West, we usually think of spices as coming from the East by camel caravan. The high price of pepper during the Middle Ages was one of the chief reasons for the attempts to find a sea-route to India.

These plants owe their flavor to the essential oils in them. We eat the fruit of some of them, as in the case of pepper, cayenne, pimento, nutmeg, mace and vanilla; in others, such as cinnamon and cassia, we use the bark; and in the case of ginger the rootstock.

The most widely used of all the spices is pepper, of which there are several kinds. The commonest variety is known to commerce as black pepper, or *piper nigrum,* as the botanists call it. It is the ground-up berry of a plant that grows wild in the East Indies, and is cultivated not only in India, but in other parts of the East, including Sumatra, Java, Borneo and the Philippines. It has also been introduced into the West Indies.

It is a creeping or climbing plant with a dark-colored stem, and the drooping branches bear spikes of green flowers which develop into bright red berries the size of peas. These, when dried, are the peppercorns of commerce. Each berry contains a single round seed, brownish at first but changing almost to black when dried. A vigorous pepper plant will yield as much as six or seven pounds of pepper.

The plant, in cultivation, is always supported on poles or on trees planted for the purpose, and the pepper stem twines round this support to a considerable height. Trees are more often used than poles, as the plant thrives best where there is a certain amount of shade. The berries are gathered as they change from green to red. This is the period when they are most pungent. After gathering they are spread out on mats in the sun to dry. As they dry they become wrinkled and black, and in that state are known as black pepper.

White pepper comes from the same plant, and is simply the seed of the berry freed from the skin and fleshy part of the fruit. The berries are soaked in water till they become soft, and the covering is then rubbed away from the seed. The pepper thus produced is gray, and in order to give it a more attractive appearance it is often bleached with chlorin gas. It certainly looks better after bleaching, but some of the flavor is sacrificed in the process.

White pepper is never so pungent as black pepper, as the substances which give the flavor are more abundant in the outer covering than in the seed itself. To get the full spicy flavor of pepper the berries should be freshly ground as required in a special mill for table use.

The pepper plant is propagated by cuttings which do not produce fruit for the first three years; but in the fourth year they bear, and yield more and more berries every year till the eighth, when they begin gradually to decline. There are two crops a year.

Several other plants related to the common pepper plant are cultivated in the East Indies, but the fruits of these are used chiefly in the countries where they grow. One, however, known as long pepper, yields a more pungent berry than the common pepper, and its dried fruits are used in pickling and also in medicine. The plant is a climbing shrub with woody stems, and the berries, which are green at first, become dark red and often black when ripe. They are gathered in the unripe state, as they are then more pungent.

Cayenne, or bird, pepper comes from quite a different kind of plant, a member of the family that includes our deadly nightshade. They are natives of South and Central America, but have spread over the world. The same plant yields the peppers so well known in pickles, and cayenne pepper is simply these peppers dried and ground to powder. Pod pepper and red pepper are from the same plant.

A TROPICAL PLANT THAT GROWS OUT OF DOORS IN MANY COUNTRIES

The plant that yields these valuable products is the *capsicum,* and there are several species, varying only in the shape, size and color of the fruits they bear. All have the same strongly pungent quality. They are cultivated in most tropical and subtropical countries, and the consumption is enormous. In India they are generally ground into a paste between two stones with mustard oil, ginger and salt, and the product forms the seasoning which millions of people have for the rice that constitutes their daily fare.

Chilli is the Mexican name for all varieties of the capsicum, and in Mexico the quantity of chillis eaten is quite as great as the quantity of salt. The plant has a branching stem growing about two feet high, and there are long narrow dark green leaves, white flowers, and buds that are in some varieties long, in others heart-shaped, and in others round like cherries. Sometimes they are red and sometimes yellow.

Though a tropical plant, the capsicum will grow in our gardens. The pepper made from the dried chillis is a very valuable product, acting as a stimulant and as an aid to digestion. It is considered of particular value in hot countries.

Another spice that often goes by the name of pepper is Jamaica pepper, more commonly called pimento or allspice. The name comes from the Spanish word for pepper. This is the fruit of a small tree that is a native of the West Indies, and flourishes in the northern part of Jamaica. It is a very beautiful plant. The white blossoms show up daintily against the dark, evergreen foliage, and the delicious odor is carried by the breezes for a considerable distance. Even the leaf, when bruised, emits a rich fragrance.

A WEST INDIAN FRUIT THAT COMBINES THE FLAVOR OF MANY SPICES

The usual height of the tree is twenty or thirty feet, but it sometimes grows to forty feet. One tree will produce as much as 150 pounds of raw fruit, yielding about 100 pounds of dried pimento. The fruit is very fragrant, and is said to combine the flavors of cinnamon, nutmeg and clove; hence its name of allspice.

A delicate oil is distilled from the leaves, which is sometimes passed off as oil of cloves. The berries are gathered before they are ripe, as they are then at the height of their fragrance and flavor. They are about the size of peppercorns. They are spread out in the sun on terraced floors for about a week, during which they change in color from green to reddish brown. Some planters dry them in kilns, but the product is not so good as when the berries are sun-dried.

The crop is a rather difficult one to grow, as it is so uncertain, and a really good crop may occur only once in four or five years. The oil of pimento, which gives the fruit its fragrance and flavor, is distilled from the berries, and is sometimes used as a remedy in toothache. The pimento tree is a relative of the myrtle.

TWO SPICES THAT COME FROM THE SAME TROPICAL TREE

Nutmeg and mace both come from the fruit of several species of tropical trees that are natives of Asia, America and Madagascar. Most of the nutmegs of

THE CINNAMON IS DRIED IN THE SUN

Cutting down the branches of the cinnamon plant on a plantation near Colombo, in Ceylon.

Peeling the branches by scraping away the outer skin and cutting off the bark.

Laying out the strips of cinnamon bark on framework tables to dry in the sun.

Photos, Australian Government, Messrs. Harrisons Crosfield, H. Irving, and others.

commerce come from the fragrant *myristica* of the East and West Indies. The staminate and pistillate flowers which appear on different plants are yellowish white and bell-shaped, and these develop into a curious and interesting fruit in shape something like a round pear. When ripe, it is a bright golden yellow. The outer part of the fruit is thick and fleshy, and sweet and hard, not unlike candied fruit in texture, and it is eaten as a sweetmeat in the lands where it grows.

When the fruit is ripe, the outer covering splits into two valves, and we see the mace, a curious network of bright, yellowish red, covering the shell of the nut itself. The botanical name for this mace is aril, and we have an instance of the aril in the red cup round the seed of the yew tree. The more brilliant in color the aril is, the better the flavor of the mace. This is dried for a short time, but if it is dried too much, a great part of the flavor goes off in the evaporation of the moisture, and it becomes so brittle that it is broken up in packing for the market. On the other hand, it must be dried sufficiently or it will ferment after packing, and be ruined.

A NUT THAT MUST BE DRIED BEFORE IT CAN BE CRACKED

Having removed the aril, we come to the shell of the nut, which is larger and harder than a filbert. If broken when gathered, the nut, which fits very closely inside, would be damaged. The unbroken nut is therefore dried in the sun and afterward by fire heat, which causes the kernel to shrink up so much that it will rattle if the shell is shaken. The shell can then be broken and the nut extracted.

The nuts are next soaked in sea-water and lime several times and dried, or they may be coated with lime. This is supposed to preserve the substance and flavor of the nut. The nutmegs are then ready to be packed and sent to market. We get oil of mace by pressing the nutmegs, and an essential oil of nutmegs is obtained from the nuts by distillation.

Nutmeg trees generally flower for the first time about the seventh year, but if the first flowering can be postponed till the ninth year, the tree is much more valuable and will bear better. Some trees bear as many as ten thousand nutmegs a year, but the majority have only three or four thousand. The demand for nutmegs is very large, and several million pounds a year are sent to Europe and America.

Cloves are the flower buds of the clove tree, a member of the Pink Family, and a relative of the carnation, bladder campion, ragged robin, corn-cockle, and many other familiar wild flowers of the countryside. The tree grows from twenty to forty feet high, and the trunk divides into large branches which are covered with a smooth gray bark. The leaves are long and lance-shaped and bright green in color; and leaves, flowers and bark all possess the odor peculiar to cloves.

THE SPICY FRAGRANCE AND BEAUTY OF THE CLOVE TREE OF JAVA

The flowers, which grow in bunches at the ends of the branches, are of a delicate peach-blossom color. As the corolla fades, the flower turns first yellow and then red. At this stage, when the fruit is developing, the flowers are beaten from the tree. After being dried, first by the heat of wood fires and then in the sun, they become brown and are the cloves of commerce. Sometimes the drying is done in the sun alone. If the flowers are allowed to remain on the tree, ripe berries develop resembling olives in shape. They are of a dark red color, and each berry contains one oval-shaped dark seed. These seeds are sometimes gathered and dried, but at this stage the fragrant properties of the clove have been largely dissipated. The oil of cloves, which gives the flavor and fragrance to this spice, forms about one-sixth of the total weight of the clove. It is obtained by distillation with water.

The clove tree is a beautiful plant, and Sir Thomas Raffles, who was governor of Java when that island was British, at the beginning of the nineteenth century, declared that "clove trees as an avenue to a residence are perhaps unrivalled—their noble height, the beauty of their form, the luxuriance of their foliage, and above all, the spicy fragrance with which they perfume the air produce, on driving through a long line of them, a degree of exquisite pleasure only to be enjoyed in the clear, light atmosphere of these latitudes."

AN ORCHID WHICH IS OF GREAT USE TO MAN

Vanilla, so much used in flavoring chocolate and other confectionery, is obtained from the fruit of the vanilla plant. It is the only member of the Orchid Family that yields a food product of importance. The plant is a native of trop-

ical America and Asia. The Spaniards found its fruit in use among the Aztecs at the time of their conquest of Mexico. It is a climbing plant with lance-shaped ribbed leaves about eighteen inches long and three inches broad. The flowers are white, with stripes of red and yellow, and these are succeeded by long, slender pods, green at first but becoming yellow as they ripen. Before they are fully ripe, however, they are gathered, and are then dried in the shade and steeped in oil or smeared with it and wrapped in oiled cotton to prevent their opening.

Inside the tough outer skin there is a dark pulp in which many seeds are imbedded. The vanilla of commerce is prepared from the dried pod, and the method of preparation varies in different parts of the world as the cultivation does.

Gathering the pods of vanilla from the vines on a Queensland plantation.

Trees to support the vanilla vines are planted about nine feet apart, and a vanilla cutting is then set at the foot of each tree and the ends tied to the tree. The vines grow rapidly, and the shoots are trained through the branches of the trees to which they attach themselves by tendrils. In about eighteen months the plants are pruned, which causes them to produce flowers on the lower branches that hang down within a foot or so of the ground.

The flowers are pollinated by hand by placing the pollen on the stigmas by means of a pointed bamboo stick. Only about thirty of the lower flowers on each vine are pollinated, and the pods reach their full size in about six weeks from their first formation.

Cinnamon is the bark of a tree belonging to the Laurel Family, and has been in use as a spice for several thousands of years. This is probably the plant referred to as cassia in the thirtieth chapter of Exodus, though in other places in the Bible cassia is the orris root. The sweet cinnamon of Exodus is thought to be another species of cinnamon.

There are several species of cinnamon trees, but most of this spice that reaches us comes from the Ceylon cinnamon tree, which is largely cultivated in that island but has also been acclimatized in the West Indies, Mauritius, Java, Sumatra, Borneo, Malabar, Brazil and other countries. In the wild state the tree reaches a height of thirty feet, and has a stem four or five feet around; but the cultivated trees are not allowed to exceed ten feet in height.

The oval leaves are five or six inches long, and taste very much like cloves. The flowers, gray outside and pale yellow inside, are of a silky texture. The fruit that develops from these is not unlike an acorn in shape, though it is much smaller. There are two cinnamon harvests in Ceylon. The branches are cut down, and the outer skin scraped away. The bark is then cut along its entire length with a sharp knife and gradually loosened until it can be removed. The strips of bark thus obtained are dried in the sun, when they curl up into tube-like lengths which are inserted in one another telescope-fashion, and tied up in bundles for the market.

The tree can be propagated by seeds, plants or layers, though it is usually cultivated by means of suckers. It is about eight years before a cinnamon plantation yields much return.

Cassia bark is a cheaper kind of cinnamon that comes from a tree growing in China, and it is often called China cinnamon in the shops. The essential oil obtained from it, though inferior in fra-

grance and flavor, is practically the same chemically. The cassia plants, from which senna and other drugs are obtained, belong to the Leguminous Family which includes the peas and beans.

Ginger is the dried rootstock of the common ginger plant, which, though a native of southeastern Asia, is now cultivated in other tropical countries, including the West Indies and Sierra Leone. When the stem has withered, the rootstock is taken up, and it is either scalded with boiling water and then dried in the sun, or it is scraped and washed and then dried. The first method yields the so-called black ginger of commerce, which is not really black; and the second process produces white ginger, which is gray, and not white. The preserved ginger that we buy is prepared from young rootstocks.

AN INDIAN PLANT THAT YIELDS DYE, MEDICINE AND FLAVORING

Turmeric, used not only as a dye and a medicine, but also as a flavor in many East Indian dishes, including curry powder, is obtained as a dark yellow powder from the tubers of the curcuma plant, a near relative of the ginger. It is a handsome herbaceous plant cultivated all over India, China and the Dutch East Indies. The essential oil that gives it its peculiar flavor is called turmerol.

Caraway seeds are the fragrant carpels of the common caraway plant that is often found growing wild, though in such places it is only a naturalized escape from cultivation. The plant is a member of the Parsley Family.

Coriander seed, used very much for flavoring in Germany and other European countries, is the fruit of the coriander plant, an annual belonging to the Umbelliferous, or Parsley, Family. It is a native of the south of Europe and of the East, but has been a good deal cultivated in other countries. Large quantities of coriander seeds are produced in India.

WHY THE ANISE WILL NOT RIPEN IN AN ENGLISH GARDEN

Another plant of the same family is the anise, from which we obtain aniseed (or anise-seed) used so much as a condiment, a medicine and a flavoring for sweets. It is a native of Egypt, and is cultivated in Spain and Germany, as well as in Syria and Malta. For two hundred years attempts have been made to cultivate it commercially in England, but the British summer is not often warm enough to ripen the seeds, which are the part used as a condiment. The plant is, however, often grown in English gardens for use in garnishing and seasoning. It is a near relative of the burnet saxifrage.

Capers are the flower buds of the caper plant, a native of Mediterranean countries. It is a trailing shrub, and often grows out of the joints of an old wall or the fissures of a rock. It has a woody stem, and the white flowers would, if allowed to remain, bloom throughout the summer; but before they open, the buds are gathered for pickling.

Mustard is one of the commonest and most familiar of condiments, and it is said that more is thrown away unused than is ever eaten. It is prepared from the seeds of three plants, one of which, known generally as charlock, grows wild in the fields, and is a great pest; but it is also cultivated for commercial use.

The other mustard plants, known as black mustard and white mustard, are also found wild. They are the kinds from which the mustard used at table is chiefly prepared. The more pungent black mustard is preferred in Europe, except in England, where the white mustard is cultivated in large quantities in the eastern counties. White mustard is also grown in gardens and used as a salad plant with cress. For a condiment the dried seeds are ground up.

DIFFERENT WAYS IN WHICH THE MUSTARD PLANT IS USED BY MAN

The mustard plants, which are members of the Cabbage Family, grow two or three feet high, and have bright yellow flowers. There are few more striking sights than a field of white mustard in full blossom. All the mustard plants are hairy, and their seeds form in pods. Those of black mustard are smaller than the other species. From both black and white mustard seed a useful oil is obtained by pressure and known as mustard oil. It is much used as a liniment. Mustard is also used in preparing plasters and poultices.

Peppermint is a plant widely distributed in temperate regions, and is found growing wild in some places; but it is cultivated for the well-known essential oil used so much in flavoring sweets and in disguising unpleasant medicines. The peculiar odor of the oil is due to the menthol, or peppermint-camphor, it contains.

THE NEXT STORY OF PLANT LIFE IS ON PAGE 3151.

FIFTY PLANTS PRECIOUS TO MAN

We give here pictures of fifty-one plants which are all valuable to man for food or clothing, or as beverages or medicines, or for use in industry. They are well known by name, but we believe there is no other book now available which gives them all in their natural colors as shown here.

1. GUM ARABIC. 2. SUMAC. 3. BENZOIN. 4. TRAGACANTH. 5. CAOUTCHOUC. 6. JUTE. 7. COTTON. 8. FLAX. 9. GUTTA-PERCHA. 10. HEMP. 11. MANIOC, OR CASSAVA. 12. SWEET POTATO. 13. YAM.

Many of the drawings on this page show familiar spice plants, largely used in flavoring foods.

1. GINGER. 2. CLOVE. 3. CAPER. 4. ARROWROOT. 5. BLACK PEPPER. 6. CAYENNE PEPPER. 7. NUTMEG. 8. LOGWOOD. 9. CORN. 10. CINNAMON. 11. ALLSPICE, OR PIMENTO. 12. MADDER. 13. MILLET.

The plants on this page are of great value to doctors, yielding some of our most important medicines.

FROM LEFT TO RIGHT THESE PLANTS ARE: SENNA, JALAP, CASTOR OIL, PERUVIAN BARK, OPIUM POPPY, NUX VOMICA, TURKEY RHUBARB, ALOE, IPECACUANHA, SARSAPARILLA, SQUILL, GAMBOGE

1. COFFEE. 2. TEA. 3. DATE-PALM. 4. BANANA. 5. CACAO. 6. JACK FRUIT. 7. BREADFRUIT. 8. PISTACHIO. 9. PANDANUS. 10. GUAVA. 11. LITCHI. 12. BRAZIL NUT. 13. MANGO.

While some of the fruits shown on this page are familiar to us, and can be bought in the market, others are practically unknown outside the countries where they grow. Some tropical fruits are very difficult to pack, and do not travel well; others have a peculiar flavor which renders them unpalatable to civilized taste, although they may be appreciated by natives.

A FAMOUS POEM BY MATTHEW ARNOLD

MATTHEW ARNOLD, if not in the first rank of English poets, is still one of the greatest in the second. He wrote many books, chiefly as a critic, although perhaps his poems will outlast his criticisms of literature and religion. The eldest son of Dr. Arnold, of Rugby, England's most famous schoolmaster, he was born on December 24, 1822, and died on April 15, 1888. Most of his active life was spent as a school-inspector, but for ten years he was also Professor of Poetry at Oxford.

THE FORSAKEN MERMAN

CONTINUED FROM 2908

COME, dear children, let us away;
Down and away below!
Now my brothers call from the bay;
Now the great winds shoreward blow;
Now the salt tides seaward flow;
Now the wild white horses play,
Champ and chafe and toss in the spray.
Children dear, let us away!
This way, this way!

Call her once before you go—
Call once yet!
In a voice that she will know:
"Margaret! Margaret!"
Children's voices should be dear
(Call once more) to a mother's ear;
Children's voices, wild with pain—
Surely she will come again!
Call her once and come away,
This way, this way!
"Mother dear, we cannot stay!
The wild white horses foam and fret."
Margaret! Margaret!

Come, dear children, come away down.
Call no more!
One last look at the white-wall'd town,
And the little grey church on the windy shore,
Then come down!
She will not come, though you call all day.
Come away, come away!

Children dear, was it yesterday
We heard the sweet bells over the bay?
In the caverns where we lay,
Through the surf and through the swell,
The far-off sound of a silver bell?
Sand-strewn caverns, cool and deep,
Where the winds are all asleep;
Where the spent lights quiver and gleam;
Where the salt weed sways in the stream;
Where the sea-beasts, ranged all round,
Feed in the ooze of their pasture-ground;
Where the sea-snakes coil and twine,
Dry their mail and bask in the brine;
Where great whales come sailing by,
Sail and sail, with unshut eye,
Round the world for ever and aye?
When did music come this way?
Children dear, was it yesterday?

Children dear, was it yesterday
(Call yet once) that she went away?
Once she sate with you and me,
On a red gold throne in the heart of the sea,
And the youngest sate on her knee.
She comb'd its bright hair, and she tended it well,
When down swung the sound of a far-off bell.
She sigh'd, she look'd up through the clear green sea.
She said: "I must go, for my kinsfolk pray
In the little grey church on the shore to-day.
'Twill be Easter-time in the world—ah me!
And I lose my poor soul, Merman, here with thee."
I said: "Go up, dear heart, through the waves.
Say thy prayer, and come back to the kind sea-caves!"
She smiled, she went up through the surf in the bay.
Children dear, was it yesterday?

Children dear, were we long alone?
"The sea grows stormy, the little ones moan.
Long prayers," I said, "in the world they say.
Come!" I said, and we rose through the surf in the bay.
We went up the beach, by the sandy down
Where the sea-stocks bloom, to the white-wall'd town,
Through the narrow paved streets, where all was still,
To the little grey church on the windy hill.
From the church came a murmur of folk at their prayers,
But we stood without in the cold blowing airs.
We climb'd on the graves, on the stones worn with rains,
And we gazed up the aisle through the small leaded panes.
She sate by the pillar; we saw her clear:
"Margaret, hist! come quick, we are here!
Dear heart," I said, "we are long alone;
The sea grows stormy, the little ones moan."
But, ah! she gave me never a look,
For her eyes were seal'd to the holy book!
Loud prays the priest; shut stands the door.
Come away, children, call no more!
Come away, come down, call no more!

Down, down, down!
Down to the depths of the sea!
She sits at her wheel in the humming town,
Singing most joyfully.
Hark what she sings: "O joy, O joy,
For the humming street, and the child with its toy!
For the priest, and the bell, and the holy well,
For the wheel where I spun,
And the blessed light of the sun!"
And so she sings her fill,
Singing most joyfully,
Till the spindle falls from her hand,
And the whizzing wheel stands still.
She steals to the window, and looks at the sand,
And over the sand at the sea;
And her eyes are set in a stare,
And anon there breaks a sigh,
And anon there drops a tear,
From a sorrow-clouded eye,
And a heart sorrow-laden,
A long, long sigh,
For the cold, strange eyes of a little Mermaiden,
And the gleam of her golden hair.

Come away, away, children;
Come, children, come down!
The hoarse wind blows colder;
Lights shine in the town.
She will start from her slumber
When gusts shake the door;
She will hear the winds howling,
Will hear the waves roar.
We shall see, while above us
The waves roar and whirl,
A ceiling of amber,
A pavement of pearl.
Singing: "Here came a mortal,
But faithless was she!
And alone dwell for ever
The kings of the sea."

But, children, at midnight,
When soft the winds blow;
When clear falls the moonlight,
When spring-tides are low;
When sweet airs come seaward
From heaths starr'd with broom,
And high rocks throw mildly
On the blanch'd sands a gloom;
Up the still, glistening beaches,
Up the creeks we will hie,
Over banks of bright seaweed
The ebb-tide leaves dry.
We will gaze from the sand-hills
At the white, sleeping town;
At the church on the hillside—
And then come back down.
Singing: "There dwells a loved one,
But cruel is she!
She left lonely for ever
The kings of the sea."

CHERRY RIPE

CHERRY ripe, ripe, ripe, I cry,
Full and fair ones—come and buy;
If so be you ask me where
They do grow—I answer, There,
Where my Julia's lips do smile—
There's the land, or cherry-isle;
Whose plantations fully show
All the year where cherries grow.

—Robert Herrick.

THE LARK

Some of the most delightful writing of the age of Shakespeare, and the age which followed him, is found in the songs that were scattered through the plays of the period. This is an example from Thomas Heywood's tragedy of Lucrece, written in 1608.

PACK, clouds, away, and welcome, day,
With night we banish sorrow;
Sweet air, blow soft; mount, lark, aloft,
To give my Love good-morrow!
Wings from the wind to please her mind,
Notes from the lark I'll borrow;
Bird, prune thy wing; nightingale, sing,
To give my Love good-morrow.
To give my Love good-morrow,
Notes from them both I'll borrow.

Wake from thy nest, Robin-red-breast,
Sing, birds, in every furrow;
And from each hill, let music shrill
Give my fair Love good-morrow!
Blackbird and thrush in every bush,
Stare, linnet, and cock-sparrow,
You pretty elves, amongst yourselves
Sing my fair Love good-morrow.
To give my Love good-morrow,
Sing, birds, in every furrow!

MY OLD KENTUCKY HOME, GOOD-NIGHT

This dear old folk-song of the South is well known throughout the broad land, and its author, Stephen Collins Foster, has written many such poems.

THE sun shines bright in the old Kentucky home;
'Tis summer, the darkeys are gay;
The corn-top's ripe, and the meadow's in the bloom,
While the birds make music all the day.
The young folks roll on the little cabin floor,
All merry, all happy and bright;
By-'n'-by hard times comes a-knocking at the door;
Then my old Kentucky home, good-night!
Weep no more, my lady,
O, weep no more to-day!
We will sing one song for the old Kentucky home,
For the old Kentucky home, far away.

They hunt no more for the possum and the coon,
On the meadow, the hill and the shore;
They sing no more by the glimmer of the moon,
On the bench by the old cabin door.
The day goes by like a shadow o'er the heart,
With sorrow, where all was delight;
The time has come when the darkeys have to part:
Then my old Kentucky home, good-night!

The head must bow, and the back will have to bend,
Wherever the darkey may go;
A few more days, and the trouble all will end,
In the field where the sugar-canes grow.
A few more days for to tote the weary load:
No matter, 'twill never be light;
A few more days till we totter on the road:
Then my old Kentucky home, good-night!
Weep no more, my lady,
O, weep no more to-day!
We will sing one song for the old Kentucky home,
For the old Kentucky home, far away.

THE MAN WITH THE HOE*

This grim poem is by Edwin Markham, a prominent American poet who was born in 1852. It was suggested to the poet by a painting by the French artist Jean François Millet, entitled The Man with the Hoe. The poet was so struck with the brutish hopelessness of the man in the painting that in a passion of pity he penned this poem which has gained an undying fame.

BOWED by the weight of centuries he leans
Upon his hoe and gazes on the ground,
The emptiness of ages in his face,
And on his back the burden of the world.
Who made him dead to rapture and despair,
A thing that grieves not and that never hopes,
Stolid and stunned, a brother to the ox?
Who loosened and let down this brutal jaw?
Whose was the hand that slanted back this brow?
Whose breath blew out the light within this brain?

THE MAN WITH THE HOE, BY JEAN FRANÇOIS MILLET

Is this the Thing the Lord God made and gave
To have dominion over sea and land;
To trace the stars and search the heavens for power;
To feel the passion of Eternity?
Is this the Dream He dreamed who shaped the suns
And pillared the blue firmament with light?
Down all the stretch of Hell to its last gulf
There is no shape more terrible than this—
More tongued with censure of the world's blind greed—
More filled with signs and portents for the soul—
More fraught with menace to the universe.
What gulfs between him and the seraphim!
Slave of the wheel of labor, what to him
Are Plato and the swing of Pleiades?
What the long reaches of the peaks of song,
The rift of dawn, the reddening of the rose?
Through this dread shape the suffering ages look;
Time's tragedy is in that aching stoop;
Through this dread shape humanity betrayed,
Plundered, profaned, and disinherited,
Cries protest to the Judges of the World,
A protest that is also prophecy.
O masters, lords, and rulers in all lands,
Is this the handiwork you give to God,
This monstrous thing distorted and soul-quenched?
How will you ever straighten up this shape;
Touch it again with immortality;
Give back the upward looking and the light;
Rebuild in it the music and the dream;
Make right the immemorial infamies,
Perfidious wrongs, immedicable woes?
O masters, lords, and rulers in all lands,
How will the Future reckon with this Man?
How answer his brute question in that hour
When whirlwinds of rebellion shake the world?
How will it be with kingdoms and with kings—
With those who shaped him to the thing he is—
When this dumb Terror shall reply to God,
After the silence of the centuries?

*Copyright by Edward Markham, 1899, 1924, from The Man with the Hoe and Other Poems.

DECEMBER'S SNOW

The shortening of life for each married pair by the passing of the years, but the failure of swift Time to weaken love that is true and deep, are here depicted with tenderest feeling and reassuring truth by Sir Arthur Conan Doyle.

THE bloom is on the may once more,
The chestnut buds have burst anew;
But, darling, all our springs are o'er,
'Tis winter still for me and you.
We plucked Life's blossoms long ago;
What's left is but December's snow.

But winter has its joys as fair,
The gentler joys, aloof, apart;
The snow may lie upon our hair,
But never, darling, in our heart.
Sweet were the springs of long ago,
But sweeter still December's snow.

Yes, long ago, and yet to me
It seems a thing of yesterday:
The shade beneath the willow tree,
The word you looked but feared to say.
Ah! when I learned to love you so
What recked we of December's snow?

But swift the ruthless seasons sped,
And swifter still they speed away.
What though they bow the haughty head
And fleck the raven hair with grey?
The boy and girl of long ago
Are laughing through the veil of snow.

HERACLITUS

This very beautiful little poem by William Cory, generally called William Johnson Cory because his name was formerly Johnson, is supposed to be a farewell tribute from the friend of a Greek poet, whom we know only by tradition. There was a famous Heraclitus, a philosopher of Ephesus, who lived five hundred years before the birth of Christ, but the Heraclitus here addressed was a different person, who lived a century or more later. Whereas the philosopher's language was uncouth and difficult to understand, the poems of the later Heraclitus were famed for their beautiful melody and simplicity. The life of the philosopher is dealt with in another page of this book. William Cory, was a well-known scholar and an assistant master at Eton College. Caria was a place in Asia Minor where Heraclitus lived.

THEY told me, Heraclitus, they told me you were dead,
They brought me bitter news to hear and bitter tears to shed.
I wept as I remembered how often you and I
Had tired the sun with talking and sent him down the sky.

And now that thou art lying, my dear old Carian guest,
A handful of grey ashes, long, long ago at rest,
Still are thy pleasant voices, thy nightingales, awake;
For Death, he taketh all away, but them he cannot take.

The autumn is a gipsy, when the frost is in the air;
A joyous, tattered wanderer, with sumac in her hair.

ORPHEUS AND HIS LUTE

From Shakespeare's play King Henry VIII.

ORPHEUS with his lute made trees,
And the mountain-tops that freeze,
Bow themselves when he did sing:
To his music, plants and flowers
Ever sprung; as sun and showers
There had made a lasting spring.

Everything that heard him play,
Even the billows of the sea,
Hung their heads, and then lay by.
In sweet music is such art,
Killing care and grief of heart
Fall asleep, or hearing, die.

AMENDS TO NATURE

We never really understand the big world that we call Nature till we feel ourselves part of it. That is what Arthur Symons, a modern poet, says in these verses.

I HAVE loved colours, and not flowers;
Their motion, not the swallow's wings,
And wasted more than half my hours
Without the comradeship of things.

How is it now that I can see,
With love and wonder and delight,
The children of the hedge and tree,
The little lords of day and night?

How is it that I see the roads,
No longer with usurping eyes,
A twilight meeting-place for toads,
A mid-day mart for butterflies?

I feel in every midge that hums
Life, fugitive and infinite,
And suddenly the world becomes
A part of me and I of it.

APOLOGIA

Dying is a crisis which few poets face fairly. Not so Edmund Gosse. He is candid and sincere in his view of himself and what he fears and hopes for at the last. And who will say his hopes are not well founded if sufficient breadth be given to his interpretation of the word Love?

I HAVE not sinned against the God of Love,
And so I think that when I come to die
His face will reach to me, and hang above,
And comfort me, and hush me where I lie.

Weak am I, full of faults, and on the brink
Of Death perchance with awe my pulse shall move;
I am not fit to die, and yet I think
I have not sinned against the God of Love.

I have desired fame, riches, the clear crown
Of influence, and pleasure's long-drawn zest,
Yet at all times I would have laid these down
To please the human heart that I love best.

Wherefore I hope, when I must go my way
Down that dark, doubtful road that mortals prove,
Some one will cheer my shivering soul, and say:
He has not sinned against the God of Love.

BABYLON

This poem is a most interesting instance of the free use of imagination in describing what was probably felt by people who took part in a historical movement long ago. The writer is John Buchan, one of the most versatile Scottish authorities and a well-known novelist.

WE are come back from Babylon,
Out of the plains and the glare,
To the little hills of our own country,
And the sting of our kindred air;
To the rickle of stones on the red rock's edge
Which Kedron cleaves like a sword.
We will build the walls of Zion again
To the glory of Zion's Lord.

Now is no more of dalliance
By the reedy waters in spring,
When we sang of home and sighed and dreamed,
And wept in remembering.
Now we are back in our ancient hills,
Out of the plains and the sun;
And before we make it our dwelling-place
There's a wonderful lot to be done.

The walls are to build from West to East,
From Gihon to Olivet,
Waters to lead and wells to clear
And the garden furrows to set.
From the Sheep-gate to the Fish-gate
Is a welter of mire and mess;
And southward over the common lands
'Tis a dragon's wilderness.

The Courts of the Lord are a heap of dust
Where the hill winds whistle and race,
And the noble pillars of God His house
Stand in a ruined place.
In the Holy of Holies foxes lair,
And owls and night-birds build;
There's a good deal to do ere we pitch it anew
As our father Solomon willed.

Now is the day of the ordered life
And the law which all obey;
We toil by rote and speak by rote
And never a soul dare stray.
Ever among us a lean old man
Keepeth his watch and ward,
Crying: "The Lord hath set you free;
Prepare ye the way of the Lord."

A goodly task we are called unto,
A task to dream on o' nights—
Work for Judah and Judah's God,
Setting our land to rights;
Everything fair and all things square
And straight as a plummet's string—
Is it mortal guile if once in a while
Our thoughts go wandering?

We were not slaves in Babylon,
For the gate of our soul lay free;
There in that vast and sunlit land,
On the edges of mystery,
Daily we wrought and daily we thought,
And we chafed not at rod and power,
For Sinim, Sabæa, and dusky Hind
Talked to us hour by hour.

The man who lives in Babylon
May poorly sup and fare,
But loves and lures from the ends of the earth
Beckon him everywhere.

Next year he, too, may have sailed strange seas,
And conquered a diadem,
For kings are as common in Babylon
As crows in Bethlehem.

Here we are bound to the common round,
In a land which knows not change.
Nothing befalleth to stir the blood
Or quicken the heart to range;
Never a hope that we cannot plumb
Or a stranger visage in sight—
At the most a sleek Samaritan
Or a ragged Amorite.

Here we are sober and staid of soul,
Working beneath the law,
Settled amid our fathers' dust,
Seeing the hills they saw.
All things fixed and determinate,
Chiselled and squared by rule—
Is it mortal guile once in a while
To try and escape from school?

We will go back to Babylon,
Silently one by one,
Out from the hills and the laggard brooks
To the streams that brim in the sun.
Only a moment, Lord, we crave,
To breathe and listen and see,
Then we start anew, with muscle and thew,
To hammer trestles for Thee.

THE TORCH OF LIFE *

The proper title of this stirring poem in praise of the manly game of cricket is *Vitai Lampada*, which means in English "The Torch of Life." The idea of the poem is that if we keep shining in our life the spirit of honor we identify with "playing the game" we shall be making the best use of our powers. The poem is by Sir Henry Newbolt.

THERE'S a breathless hush in the Close to-night—
Ten to make and the match to win—
A bumping pitch, and a blinding light,
An hour to play, and the last man in.
And it's not for the sake of a ribboned coat,
Or the selfish hope of a season's fame,
But his Captain's hand on his shoulder smote:
Play up! Play up! and play the game!

The sand of the desert is sodden red—
Red with the wreck of a square that broke—
The Gatling's jammed, and the Colonel dead,
And the regiment blind with dust and smoke.
The river of death has brimmed his banks,
And England's far, and honour a name,
But the voice of a schoolboy rallies the ranks:
Play up! Play up! and play the game!

This is the word that year by year,
While in her place the school is set,
Every one of her sons must hear,
And none that hears it dare forget.
This they all with a joyful mind
Bear through life like a torch of flame,
And, falling, fling to the host behind—
Play up! Play up! and play the game!

* By permission of the author.

A MATCH

This is one of the most popular of the poems of Algernon Charles Swinburne, most of which are exercises in verbal melody. These verses have a lilt and lift which carry us into a dancing measure.

IF love were what the rose is,
And I were like the leaf,
Our lives would grow together
In sad or singing weather,
Blown fields or flowerful closes,
Green pleasure or grey grief;
If love were what the rose is,
And I were like the leaf.

If I were what the words are,
And love were like the tune,
With double sound and single
Delight our lips would mingle,
With kisses glad as birds are
That get sweet rain at noon;
If I were what the words are,
And love were like the tune.

If you were life, my darling,
And I your love were death,
We'd shine and snow together
Ere March made sweet the weather
With daffodil and starling
And hours of fruitful breath;
If you were life, my darling,
And I your love were death.

If you were thrall to sorrow,
And I were page to joy,
We'd play for lives and seasons
With loving looks and treasons
And tears of night and morrow
And laughs of maid and boy;
If you were thrall to sorrow,
And I were page to joy.

If you were April's lady,
And I were lord in May,
We'd throw with leaves for hours
And draw for days with flowers,
Till day like night were shady
And night were bright like day;
If you were April's lady,
And I were lord in May.

If you were queen of pleasure,
And I were king of pain,
We'd hunt down love together,
Pluck out his flying-feather,
And teach his feet a measure,
And find his mouth a rein;
If you were queen of pleasure,
And I were king of pain.

PREPAREDNESS

This is a fine example of condensed philosophy from Edwin Markham, one of America's gifted poets.

FOR all your days prepare,
And meet them ever alike:
When you are the anvil, bear;
When you are the hammer, strike.

GREAT-HEART

Who would not be proud to have given the boys of the world this fine appeal, as John Oxenham, a noted English writer of prose and verse, has done in one of his little books?

WHERE are you going, Great-Heart,
With your eager face and your fiery grace?

Where are you going, Great-Heart?
To fight a fight with all my might
For Truth and Justice, God and Right,
To grace all Life and His fair Light.
Then God go with you, Great-Heart!

Where are you going, Great-Heart?
To beard the Devil in his den;
To smite him with the strength of ten;
To set at large the souls of men.
Then God go with you, Great-Heart!

Where are you going, Great-Heart?
To end the rôle of knavery;
To break the yoke of slavery;
To give the world delivery.
Then God go with you, Great-Heart!

Where are you going, Great-Heart?
To hurl high-stationed evil down;
To set the Cross above the crown;
To spread abroad My King's renown.
Then God go with you, Great-Heart!

Where are you going, Great-Heart?
To cleanse the earth of noisome things;
To draw from life its poison-stings;
To give free play to Freedom's wings.
Then God go with you, Great-Heart!

Where are you going, Great-Heart?
To lift To-day above the past;
To make To-morrow sure and fast;
To nail God's colors to the mast.
Then God go with you, Great-Heart!

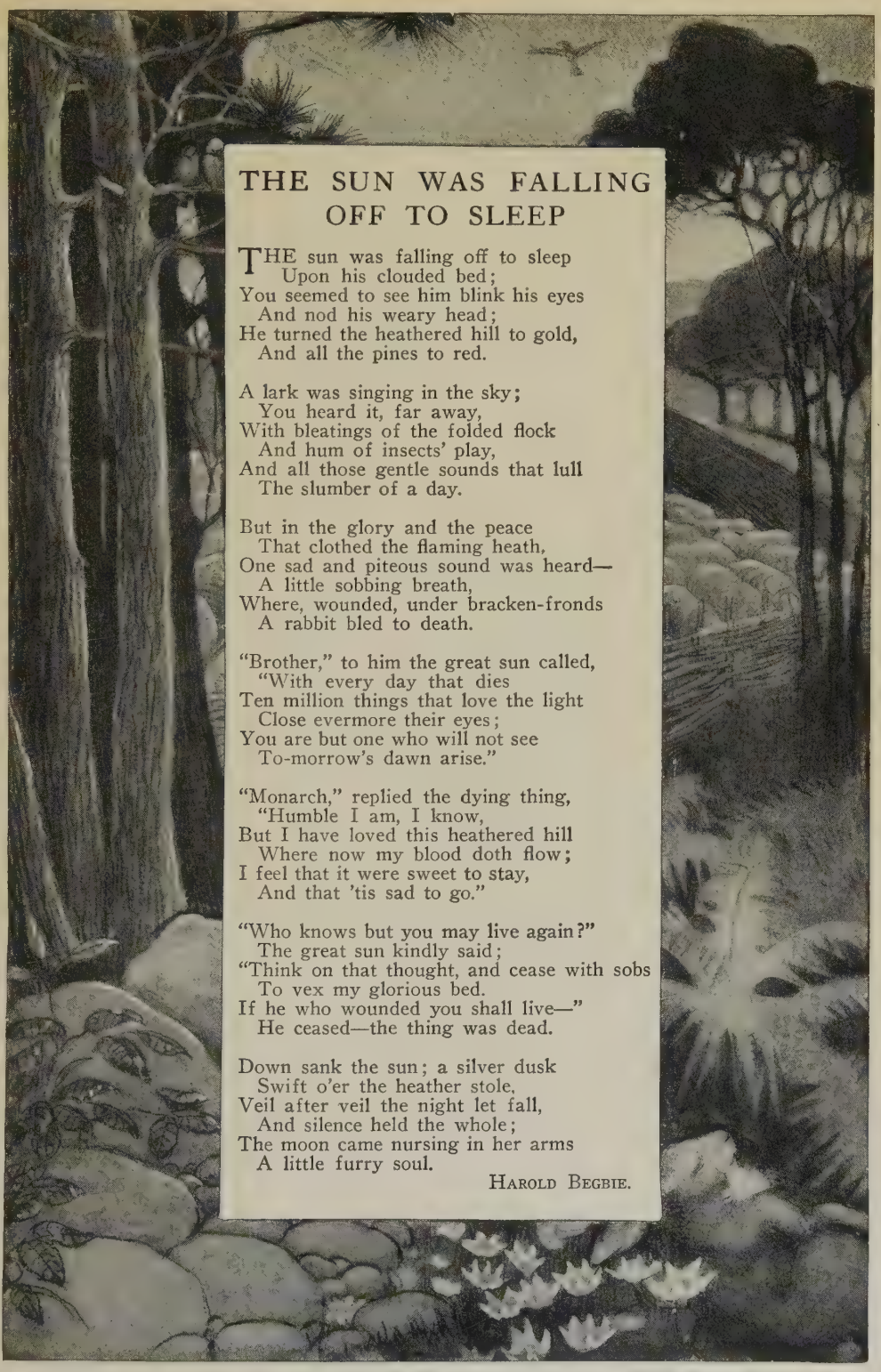
Where are you going, Great-Heart?
To break down old dividing lines;
To carry out my Lord's designs;
To build again His broken shrines.
Then God go with you, Great-Heart!

Where are you going, Great-Heart?
To set all burdened peoples free;
To win for all God's liberty;
To 'stablish His Sweet Sovereignty.
God goeth with you, Great-Heart!

A MEMORY

Memory is very capricious in the choice of the tender scenes it holds, as William Allingham reminds us in these gracefully simple lines. He lived from 1824 to 1889.

FOUR ducks on a pond,
A grass bank beyond,
A blue sky of spring,
White clouds on the wing:
What a little thing
To remember for years,
To remember with tears!



THE SUN WAS FALLING OFF TO SLEEP

THE sun was falling off to sleep
  Upon his clouded bed;
You seemed to see him blink his eyes
  And nod his weary head;
He turned the heathered hill to gold,
  And all the pines to red.

A lark was singing in the sky;
  You heard it, far away,
With bleatings of the folded flock
  And hum of insects' play,
And all those gentle sounds that lull
  The slumber of a day.

But in the glory and the peace
  That clothed the flaming heath,
One sad and piteous sound was heard—
  A little sobbing breath,
Where, wounded, under bracken-fronds
  A rabbit bled to death.

"Brother," to him the great sun called,
  "With every day that dies
Ten million things that love the light
  Close evermore their eyes;
You are but one who will not see
  To-morrow's dawn arise."

"Monarch," replied the dying thing,
  "Humble I am, I know,
But I have loved this heathered hill
  Where now my blood doth flow;
I feel that it were sweet to stay,
  And that 'tis sad to go."

"Who knows but you may live again?"
  The great sun kindly said;
"Think on that thought, and cease with sobs
  To vex my glorious bed.
If he who wounded you shall live—"
  He ceased—the thing was dead.

Down sank the sun; a silver dusk
  Swift o'er the heather stole,
Veil after veil the night let fall,
  And silence held the whole;
The moon came nursing in her arms
  A little furry soul.

HAROLD BEGBIE.

COCK ROBIN got up early
At the break of day,
And went to Jenny's window
To sing a roundelay.
He sang Cock Robin's love
To the little Jenny Wren,
And when he got unto the end,
Then he began again.

SOME little mice sat in a barn to spin;
Pussy came by, and she popped her head in.
"Shall I come in and cut off your threads?"
"Oh, no, kind sir; you will snap off our heads!"
"Oh, no, I'll not; I'll help you spin."
"That may be so; but you won't come in."

QUEEN ANNE, Queen Anne, she sits in the sun,
As fair as the lily, as white as the swan.
"I send you three letters, so pray you read one."
You must read one, if you can't read all,
So pray Miss or Master throw up the ball.

IN a cottage in Fife
Lived a man and his wife,
Who, believe we, were comical folk;
For, to people's surprise,
They both saw with their eyes,
And their tongues moved whenever they spoke.

When they were asleep,
I'm told—that to keep
Their eyes open they could not contrive;
They both walked on their feet,
And 'twas thought what they eat
Helped, with drinking, to keep them alive.

A PIE sat on a pear-tree,
A pie sat on a pear-tree,
A pie sat on a pear-tree,
Heigh O, heigh O, heigh O!
Once so merrily hopped she,
Twice so merrily hopped she,
Thrice so merrily hopped she,
Heigh O, heigh O, heigh O!

THERE was a man of Thessaly,
And he was wondrous wise,
He jumped into a quickset hedge,
And scratched out both his eyes.

But when he saw his eyes were out,
With all his might and main
He jumped into another hedge,
And scratched them back again.

"ROBERT BARNES, fellow fine,
Can you shoe this horse of mine?"
"Yes, good sir, that I can,
As well as any other man;
Here's a nail, and there's a prod,
And now, good sir, your horse is shod."

MY father he left me three acres of land,
Sing ivy, sing ivy;
My father he left me three acres of land,
Sing holly, go whistle, and ivy!

I ploughed it with a ram's horn,
Sing ivy, sing ivy;
And sowed it all over with one peppercorn,
Sing holly, go whistle, and ivy!

I harrowed it with a bramble bush,
Sing ivy, sing ivy;
And reaped it with my little penknife,
Sing holly, go whistle, and ivy!

WHAT WERE THE FIRST BUILDINGS LIKE?

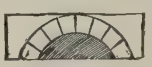
CONTINUED FROM 2874

THE first things men ever lived in were probably not buildings at all: they were holes or caves. We have found some of these caves with bones and teeth and other things which tell us what these men had for dinner long ago. Apparently, the first attempt man made to build was simply to make the caves bigger and more convenient.

When at last man began to build for himself he made huts, such as many men live in even nowadays. These huts are really very much like caves, with only one story and one room and no chimney. Men were a long time in rising from the use of these early huts to such cathedrals as those of Milan, and St. Mark's in Venice. In time man learned to use stone, and even to make artificial pieces of stone which we call bricks, and, of course, with these he could make fine buildings elaborate in design and detail.

Everyone agrees which is the finest building made before the rise of Rome to power. This is called the Parthenon. The Parthenon was built about five hundred years before the birth of Christ, in the greatest age of Greece. It was built entirely of white marble, and the figures of horses and men that ran round it outside were made by Phidias. Some say that he was the greatest sculptor that ever lived. Many of these were moved away by Lord Elgin, and we may see them in the British Museum, where they are known as the Elgin Marbles. There are models of the Parthenon in many of the large museums in our cities.

It is one of the remarkable things about the great buildings of Greece that they do not have arches. Their buildings, indeed, were in principle the same as you can make with toy bricks. It is a curious thing that, somehow or other, though the Greeks learned so much from the Egyptians, they did not know about the arch. Yet, even in very early Egyptian buildings, we find various kinds of arches, including even the pointed arch which we see in churches. There are two kinds of arches—one is like this:



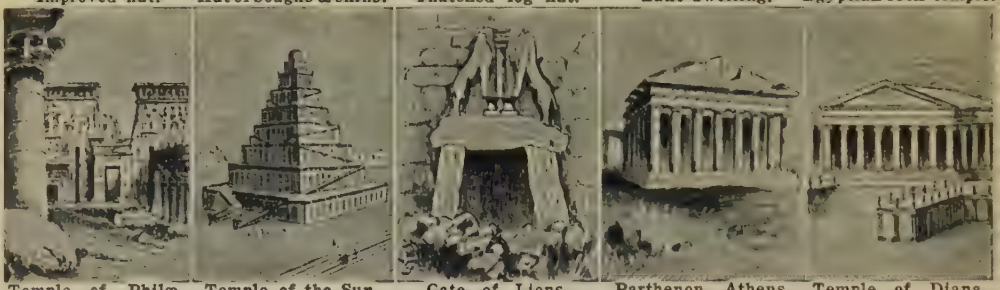
and the other is also very interesting, for it is built

up from the two sides, and then at the very top of the arch there is put in, last, a stone called the keystone, because it keys, or locks, the two sides of the arch together.

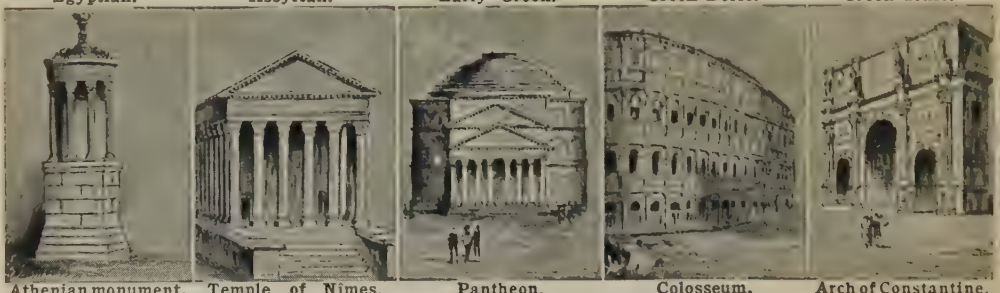
After the Greeks came the Romans. Much of what they knew and many of the things they did they learned from the Greeks. But the Romans did not build so beautifully as the Greeks. There never was any building in Rome so lovely as the Parthenon. However, they did make one great advance over

ARCHITECTURE THROUGH THE AGES—FIFTY

Improved hut. | Hut of boughs & skins. | Thatched log hut. | Lake-dwelling. | Egyptian rock temple.



Temple of Philæ. Egyptian. | Temple of the Sun. Assyrian. | Gate of Lions. Early Greek. | Parthenon, Athens. Greek Doric. | Temple of Diana. Greek Ionic.



Athenian monument. Greek Corinthian. | Temple of Nimes. Roman Corinthian. | Pantheon. Roman. | Colosseum. Roman. | Arch of Constantine. Roman.

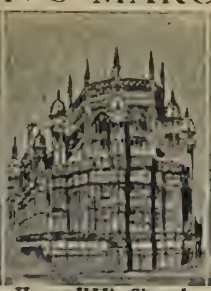
Pont du Gard, Provence. Roman. | San Sophia, Constantinople. Byzantine. | St. Mark's, Venice. Late Byzantine. | Pisa Cathedral. Romanesque. | St. Michele, Pavia. Romanesque.

St. Etienne, Caen. French Romanesque. | Worms Cathedral. German Romanesque. | Earls Barton Church. Saxon. | Castle Rising. Eng. Romanesque. | Iffley Church. Norman.

PICTURES OF MAN'S MARCH AS A BUILDER

St. Saviour's, Southwark. Early Eng.

York Minster Front. English Decorated.

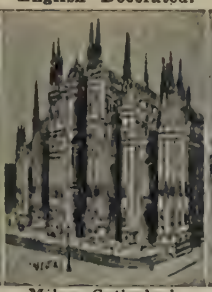


Henry VII's Chapel. Perpendicular.

Rheims Cathedral. French Gothic.

Bruges Town Hall. Belgian Gothic.

Ratisbon Cathedral. German Gothic.



Milan Cathedral. Italian Gothic.

Florence Cathedral. Italian Gothic.

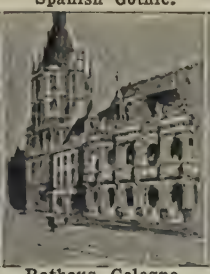
Burgos Cathedral. Spanish Gothic.

Pitti Palace. Florentine Renaissance.

San Maria, Venice. Venetian Ren'sance.

Chateau Chambord. French Renaissance.

Pantheon, Paris. French Renaissance.



Rathaus, Cologne. German Ren'sance.

Town Hall, Antwerp. Belgian Ren'sance.

St. Peter's, Rome. Roman Renaissance.

Town Hall, Seville. Spanish Ren'sance.

Wollaton Hall, Elizabethan Renaissance.

Hatfield House. Jacobean Ren'sance.

Greenwich Hospital. Renaissance.

St. Paul's Cathedral. Anglo-Classic.

Chelsea Town Hall. Queen Anne.

Newburn Council Offices. Georgian.

Houses of Parliament. Modern Gothic.

Singer Bldg., New York. American.

the Greeks. The Romans had the arch and the Greeks had not.

They were very fond of building what they called triumphal arches in honor of some great soldier or some great event, and we see such arches in Rome and many parts of Italy. The Marble Arch in London, the Arc de Triomphe in Paris and the Washington Arch in New York are the same sort of thing.

In our own times we have made a great discovery regarding buildings. Instead of building ships of wood we build them of iron and steel, and we do the same with buildings; instead of stone we use steel. We may say we are passing from the Stone Age to the Age of Metals in buildings.

Of course, in the case of a bridge, we simply use steel and do not think it necessary to do any more. One of the most wonderful bridges in the world is the Quebec Bridge, which is made of steel. That is all very well, but in ordinary buildings the builder is rather puzzled. He makes his building of steel; but we are not accustomed to buildings made simply of steel, and they would look very queer to our eyes; so after he has made the steel skeleton of his house, or of his hotel, or whatever it is, he covers it up with stone, so as to make it look as if it were really the stone that was holding it up; yet you might take all the stone away, and the building would stand. The real strength, of course, is in the skeleton framework under the outer covering. Really we are waiting for some clever man with an original mind who will be able to make a modern steel building without having to face it with stone and pretend it is made of stone. Of course, anyone could do this, but the building would look ugly. We have not yet learned how to treat steel so as to make it look beautiful.

WHAT IS THE DIFFERENCE BETWEEN ANTHRACITE AND OTHER COAL?

Anthracite is a highly fossilized coal showing very few traces of its vegetable origin, as opposed to lignite, or brown coal, in which the structure of the timber is plainly seen. It is very hard and brittle and as black as jet. Being nearly free from bitumen, or pitch, and being over ninety per cent carbon, it burns slowly, with a blue flame and little smoke, and gives out great heat. Anthracite, like coke, produces dangerous fumes which must be carried off by a flue and not allowed to escape into a room. Moreover, all stoves dry the air and use up oxygen, and for this reason ventilation must be maintained, especially in living-rooms and bedrooms. When in good working order the stove needs very little attention.

Anthracite coal, though costing about twice as much as ordinary soft coal, is economical to use. It burns continuously, giving a steady glowing heat night and day. It thus saves labor, and provides a warm atmosphere with little trouble throughout the winter months. It is interesting to note here that anthracite, like platinum, was once considered almost worthless. Indeed, the story goes that at one time it was used in the South Wales mining district and in some parts of Pennsylvania to mend the roads!

WHY DOES GRAVITATION NOT PULL DOWN BODIES LIGHTER THAN AIR?

Gravitation does pull down bodies lighter than air; it is a universal law that applies as much to particles too small and light to be weighed, as to gigantic suns. It is true that a flake of thistledown will float away in the air as if it were unaffected by gravitation; that particles may fly across to us from the sun in spite of the enormous gravitational pull exerted by the sun; and that light gases mount in the atmosphere and may fly away into space; but gravitation, nevertheless, is acting on all these bodies.

The thistledown floats away simply because the warm air ascending carries the down with it; but both the air and the down are being pulled by gravity. We have no more right to say that the thistledown and the air are not pulled down by gravity than we have to say that we are not pulled down by gravity during the time we jump into the air; or that a bullet is not pulled down by gravity while it is ascending. In each case gravity is pulling down, even though a stronger force is pulling or pushing harder in the other direction. In the case of the feather, the force opposing gravitation is the hot air. In the case of the hot air, it is the molecular force of its molecules. In the case of the particles flying from the sun, it is light pressure. In the case of a jumping man, it is his muscular force. In the case of the bullet, it is the expanding force of the explosive in the gun. But in each case gravitation is acting, and never ceases to act.

HOW DOES THE EARTH TURN WITHOUT SHAKING?

The earth is a huge and heavy ball spinning with great speed and momentum through space. Its own spinning keeps it steady like a spinning top, and its only shake is a very slow wobble on its axis, like the wobble of a top. It is probable that the steady pull of the sun, which holds the earth in its orbit, also tends to steady it. So long as it is spinning strongly and steadily through space there is really nothing to cause it to shake, unless the earth quakes in itself, as it does sometimes with terrible effect. The attraction of the moon is great enough to lift the earth's oceans and slightly to raise the earth's crust, but even that pull is not enough to shake such a heavy and steadily spinning ball as our planet.

WHAT WAS THE ANCIENT GORDIAN KNOT?

It is told that the people of Phrygia, an ancient country of Asia Minor, had been so tried for a long time that they thought their troubles would have no end. The gods declared that everything would come right if they chose as a king the first man they met on his way to Jupiter's temple. The peasant Gordius passed by, driving a wagon, and, hailed as king to his great amazement, he consecrated his wagon to the god Jupiter.

But it is not as a king that Gordius has remained famous: he is remembered simply for a knot, the knot by which he fixed his wagon to the temple. So cleverly was it tied that no end could be perceived in the cord, and it came to be predicted that whoever could untie the Gordian Knot would win the whole empire of Asia. Alexander the Great happened to pass that way, and, puzzled with the famous knot, he cut it with his sword. This daring act impressed his subjects, who considered Alexander as the future conqueror of Asia. We now speak of any complex problem that can only be solved in a drastic way as a Gordian knot.

WHY IS TIGHT CLOTHING BAD FOR US?

All our clothing, from head to feet, should be worn loose. Anything tight on the trunk of the body interferes with the movements of deep, easy breathing, and injures our health. Tight clothing is bad also because it interferes with the proper circulation of the blood through the body. Many foolish people suffer from cold feet because they wear shoes so tight that blood is simply unable to get into them. Such people almost deserve to have cold feet, and corns and chilblains, and all the other unpleasant consequences of wearing tight footgear. The proper way to keep warm is by our blood, not by cotton or leather; and the way to help the blood to do its work is to give it room to flow instead of tightening the veins and stopping its circulation.

WHY IS AN AX-HANDLE OFTEN CURVED?

There are several reasons why the handle of an ax is curved, and experience has shown that they are sound, for more work can be obtained from an ax with a curved handle than from one with a straight handle. In the first place the shape of a half-strung bow renders the handle stronger and less likely to snap when in use, as the double curve gives it added flexibility, enabling it to give in either direction under the strain of the woodman's blow. Then, the curved handle enables the ax-head to be swung through a greater distance than if it were on a straight handle, so increasing its momentum.

Finally, when the blow has been skillfully made and the blade is driven deep into a tree, the bent handle gives a better leverage for removing the ax. With the angle of the blade for a fulcrum and the head of the blade for the weight, the bent handle obviously gives a longer arm, and therefore greater power than a straight handle would give.

WHY DOES MUSTARD BURN OUR TONGUE?

There are a number of chemical substances which, when applied to the skin or the tender parts of the body, cause us to feel a sensation of burning; and mustard is one of them. It acts on the tongue or other sensitive parts as an irritant, causing the blood-vessels in the part to swell up and discharge some of their contents. If sufficient be applied, this will form a blister. This is what happens in the case of a mustard plaster, where, after the mustard has been in contact with the skin a little while, we find that a red patch is produced by the swelling of the blood-vessels. This causes pressure on the nerves, and irritation of the endings of the nerves, with the result that there is a sensation which we describe as burning. A number of other substances besides mus-

tard have the same effect, and some of them are employed by doctors as local irritants.

WHY DOES A CHIMNEY SMOKE?

When a chimney smokes, it may be for one or more of several reasons. The flue, or smoke-passage, may have been so built that there is nothing to prevent the wind from making a draft down it, so blowing the smoke into the room. To prevent down-draft in a chimney the flue should not be built straight up, but with one or more bends. Often we find that bedroom chimneys smoke while the ground floor chimneys do not. That is because, in building the flue from the ground floor, the bricklayer has to make a bend to get it into the chimney-stack, whereas on the upper floors he is only too likely to build a straight flue which allows the wind to find its way down.

Another fault in chimney-building which leads to chimney smoking is that too big a space is left over the fire. The proper way to build a chimney flue is to gather the sides together, by gradual lines, as nearly as possible above the fire. Sometimes the chimney is not high enough to give a proper draft. Once a faulty chimney is built it is difficult to cure it. The usual way is to cap the chimney with a special top.

CAN ANYTHING BOIL WHEN IT IS COLD?

Boiling is the conversion of a liquid into vapor, or gas, and the temperature at which this happens is called the boiling-point of the substance. The boiling-point of water is 212° Fahrenheit, or 100° Centigrade, but the boiling-point varies according to the pressure of the atmosphere, so that water will boil at a lower temperature at the top of a mountain than at the bottom. At the top of Mont Blanc, for instance, water boils at 185° Fahrenheit, or 85° Centigrade.

Some substances boil at a very much higher temperature than water. Gold, for instance, which melts, or becomes liquid, at 1064° Centigrade, boils at 2530°. Copper melts at 1082° Centigrade and boils at 2300°. Silicon, which forms about a quarter of the earth's crust, melts at 1500° Centigrade and boils at about 3000°. Tin melts at 231° Centigrade and boils at 2275°. These are all substances which are solid in the ordinary temperatures at which we live. Mercury, or quicksilver, which is normally a liquid, boils at 357° Centigrade.

But when we come to substances which are gases at ordinary temperatures, we find that their boiling-point is not very high, but very low. Hydrogen gas boils, or changes from the liquid into the gaseous state, at *minus* 152° Centigrade. In other words, it requires 152 degrees of frost to make hydrogen boil! Fluorine requires 187 degrees of frost to make it boil, nitrogen 194 degrees of frost, and oxygen 182 degrees of frost—all reckoned by the Centigrade thermometer. Boiling is therefore not necessarily to make a substance very hot, as many people suppose, but may actually mean to make the substance very cold. Boiling is actually the changing of a substance from the liquid state to the gaseous state.

WHO WAS CASSANDRA, AND WHY IS SHE REMEMBERED?

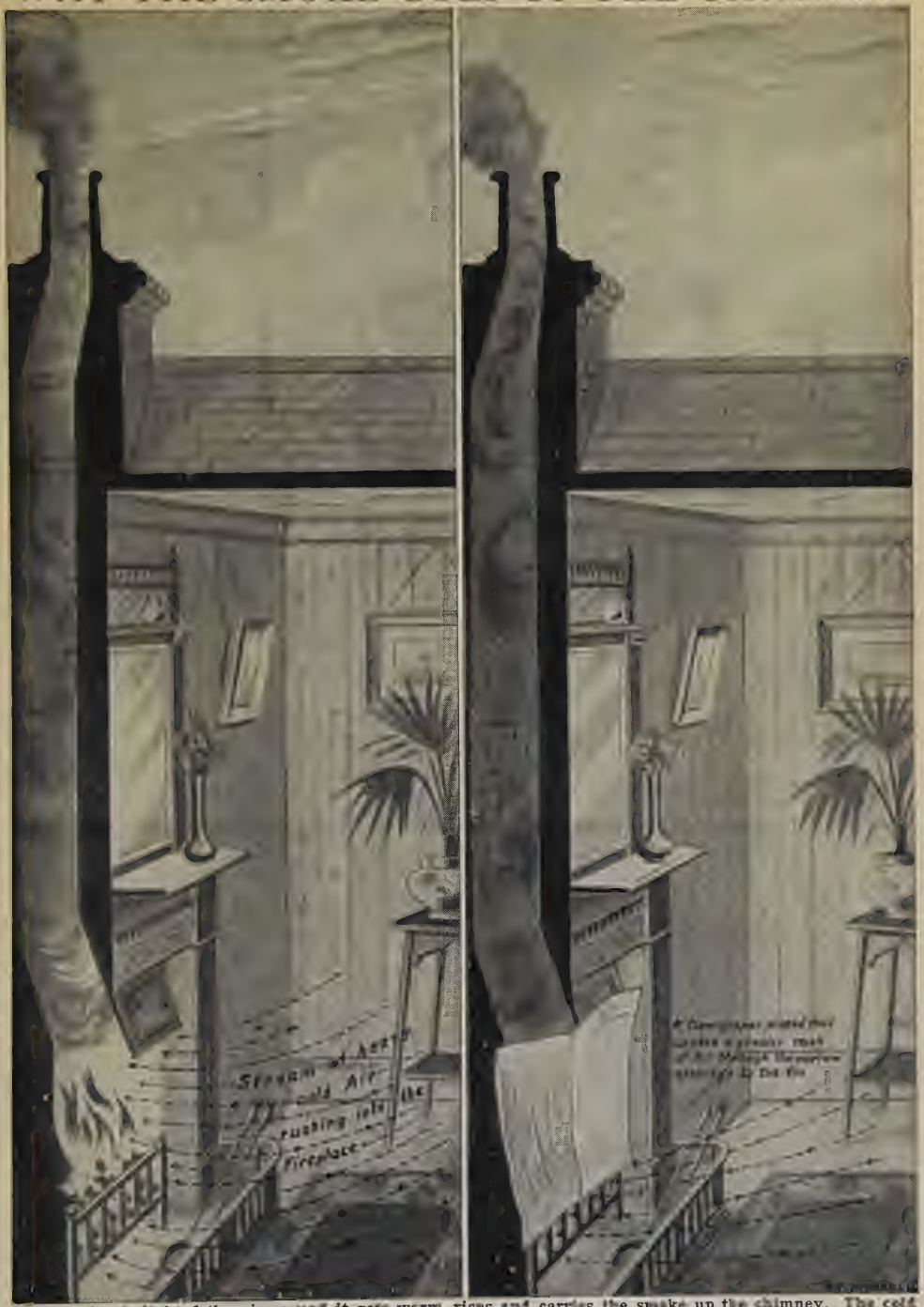
Cassandra was the daughter of Priam, king of Troy, and of Queen Hecuba. She was a favorite of Apollo, who granted her the power of prophecy. She used it ill and disappointed Apollo, who soon regretted his gift. However, as he could not recall what he had bequeathed, he declared that no predictions of Cassandra should ever be relied on unless they were evil ones.

This brought upon the prophetess the ill-will of the citizens. They grew weary of her dark threatenings and imprisoned her in a tower. There she went on with her predictions, although people would not listen; and there she announced the future trials of her country, but the people did not heed her warnings. After the Trojan War Cassandra fell to Agamemnon as a prisoner and was taken to Greece. In vain did she warn the prince of the death he was to meet, but Agamemnon died according to her prophecy, and the unfortunate Cassandra shared his fate. We now call anyone who foretells misfortune a Cassandra.

WHY HAS A WHEEL-BARROW ONLY ONE WHEEL?

A barrow has only one wheel, mainly because it is easier to push one wheel than two, since there is less friction—or less resistance. A barrow requires no back wheel because the place of back wheels is taken when at rest by wooden or steel legs, and when in motion by human legs. It does not require two wheels in front to balance it, as the legs keep it straight.

WHY THE SMOKE GOES UP THE CHIMNEY



When a fire is lighted the air around it gets warm, rises and carries the smoke up the chimney. The cold air in the room remains cooler, and as the warm air goes up the colder air rushes into the fireplace. Most of the heat from the fire in an ordinary grate is wasted by going up the chimney. As the warm air rushes up the chimney, colder air comes into the room through the doors and windows. The second picture shows why a fire burns better when a newspaper is held against the grate, with a space left below for the cold air to pass through.

Therefore, two wheels in front would make it more difficult to push and more difficult to tip over. The single wheel is really a very clever contrivance.

WHAT IS THE PAPER WE USE MADE OF?

Paper can be made of almost any fibrous vegetable material, and has been made at some time or other of wood, cotton, linen, papyrus, clover, beanstalks, straw, moss, nettles, grass, peat, sawdust, ferns and bracken, seaweed, thistles, tobacco stalks, and even gutta-percha and asbestos. But for practical purposes only a few of these substances are useful. Cotton and linen rags are ideal, but the supply is limited and the cost high. Esparto grass is largely used, but the principal material is wood-pulp, obtained from the pine tree. The supply of wood-pulp, however, has proved quite inadequate of recent years, and experiments are constantly being made to find a new raw material for the paper-maker. Probably bamboo will be used some day. We show you how paper is made in Volume Seven.

WHAT DO WE MEAN BY THE LENGTH OF A SOUND-WAVE?

When we throw a stone into a calm pond we notice that waves run out across the pond from the point where the stone entered, and that the crests of the waves are a regular distance apart. The distance from the crest of one wave to the crest of the other is the length of the wave. So it is with sound-waves. When a bell vibrates it causes waves in the air, which beat against the drum of the ear and produce in our consciousness the sensation we call sound. These air-waves, which produce sound, are called sound-waves, and their length, as in the case of water-waves, is the distance from the crest of one wave to the crest of the adjoining wave. The shorter the wave the higher is the pitch of the sound; but when the wave becomes shorter than a quarter of an inch, its sound is no longer audible to human ears.

WHAT IS THE SUDD ON THE NILE?

The sudd, named after an Arabic word meaning obstacle or barrier, is a strange feature of the Upper Nile. The waters become covered with a mass of floating plants, and these, when mixed with trunks of trees, form floating islands, which press together and finally grow into a barrier, bringing navigation to a standstill. We can therefore imagine the condition of a river like the Nile when it is completely blocked by a vast mass of semitropical vegetation; but fortunately a use has now been found for the sudd, and a factory at Khartoum dries it, reduces the material to powder and presses it into blocks for fuel for the Nile steamers. Science is also seeking to find other ways of utilizing the sudd.

WHAT IS MEANT BY THE APPIAN WAY?

The Appian Way, of which we see a picture on page 1204, was a famous Roman road made in 312 B.C. by Appius Claudius. It first ran from Rome to Capua, then down to Brindisi, over 340 miles away. It was by this road that Paul entered Rome. He was escorted from Appii Forum, a town forty miles away from the city, by the brethren.

A part of that splendid avenue was bordered for twelve miles with marble tombs of great men, like the philosopher Seneca, the triumvir Pompeius, the Scipios and the three famous men named Horatius. Rich dwellings stood on each side of the road inside the walls. From Rome to Capua the road was paved with blocks of lava closely set, like all the masonry of the time, and smoothed on the surface.

The beautiful Appian Way, known all over the ancient world, was often embellished by Roman emperors. Unhappily it fell into ruins in the Middle Ages. Digging has now brought to light a part of the road and many marble tombs.

WHAT IS THE SECRET OF LUMINOUS PAINT?

Certain chemical substances, such as the sulphids of calcium and barium, have the peculiar property of absorbing light when exposed to it and of giving out this light in darkness. The amount of light is not very great, and gradually diminishes; though on being again exposed to light the material recovers its light-giving power.

Sulphid of calcium is made by heating powdered oyster-shells and sulphur together in a closed crucible, and the product is then mixed with a varnish to form the luminous paint which is used for clock-dials, numbers on street doors, and other purposes. The luminous figures on the dials of watches are treated with a preparation of radium.

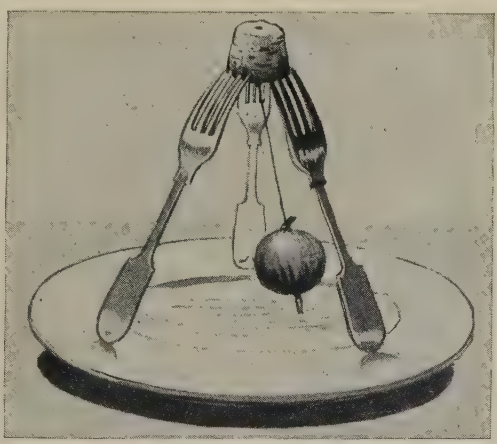
THE NEXT WONDER QUESTIONS ARE ON PAGE 3099.

FOUCAULT'S PENDULUM—HOW TO MAKE ONE

CONTINUED FROM 2882

WE all know the story of Foucault's pendulum. In 1851 the great French physicist who invented the gyroscope demonstrated the rotation of the earth by means of a huge swinging pendulum in the Pantheon at Paris.

On a metal thread seventy yards in length he attached a globe of 55 pounds weight, and underneath placed a disk divided up so that the direction of the pendulum's swing could be clearly seen. The pendulum was set swinging, and after a few minutes it veered westward, away from its original direction, thereby proving the rotation of the earth on its axis from the west to the east.



The little model complete.

The disk, or table beneath the pendulum, or "bob," as it was also called, was covered with fine sand. The pendulum itself had attached to it a "style," or small pointer, which traced in the sand the direction in which the swing took place. It was found that the style never retraced its path, but moved a little to the right.

We can perform a somewhat similar experiment for ourselves on the dining-room table. We take an apple and drive through it a thin piece of wood long enough to project at each end. To one end we tie a thread.

We now stick the prongs of three forks into a cork to form a tripod on a plate, as shown in the picture, having first stuck a pin through the cork with the head downward. To this pin we attach the free end of the thread, adjusting the length so that the pointed wood projecting from the apple, as it swings, almost touches the plate.

We set the apple pendulum swinging, and at the two extremities of the swing arrange little piles of salt through which the point will make a furrow as it passes to and fro. The point goes through the same furrows again and again, but if we slowly and gently turn the plate round, we shall find that new furrows are made, for the pendulum does not turn with the plate; it goes on swinging in the same plane as at first.

We have simply repeated on a smaller scale Foucault's famous experiment, the plate in our case representing the revolving earth and the cork the roof of the Pantheon.

Naturally, with our crude apparatus we cannot get as accurate results as Foucault. He, by marking 24 equal divisions round the edge of his table beneath the pendulum, would have had a good clock, the direction of the pendulum marking the successive hours. Of course the table beneath the pendulum would be found to revolve slowly in a direction opposite to that of the hands of a watch; but as the floor, walls and whole building revolve with the table, the pendulum would appear to be revolving in the same direction as the hands of a watch. It would be a case of relativity, the pendulum moving round relatively to the spectators who would in reality be moving with the room.

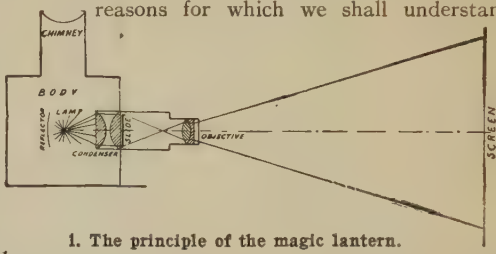
One curious fact must be remembered. If the pendulum is swung in the southern hemisphere the deviation, or leaning, will be to the left instead of to the right. At the Equator the bob would not deviate.

HOW TO MAKE A MAGIC LANTERN

IT is well to mention at once that scientific people do not use the term "magic" lantern now, but prefer the term "optical" lantern. The prefix "magic" arose in an age when scientific men were regarded as magicians, or dealers in the black art, because their researches and methods were not understood by ordinary people. There is no magic or mystery in the lantern, but it is simply an instrument of scientific value, as well as amusement, in which the laws of optics are utilized to enlarge greatly the image of an object on the slide, and to make it appear on a screen.

There is much difference between the construction of a high-class instrument of science and the little lantern which is described here, but the principle is identical in both. The elements of any lantern are, as indicated in picture 1, the *body*, or casing; the *condenser*, which receives light from the *lamp*, or other source of illumination, and transmits it through the *slide;* and finally the *objective*, or magnifying glass, which focuses the light received from the condenser through the slide and transmits it to the *screen*.

A single lantern can be made in several different ways, as well as in different sizes. A very elementary form of magic lantern might be made from an old tin cracker box, with a cheap wall-back lamp and a simple lens, and a slide-carrier made from the wood of a cigar box. But you are going to make something much more like a perfected scientific instrument, even if it entails the expenditure of a dollar or more. You will adopt the old-fashioned oil-lamp to furnish the necessary light. It is not so bright as oxy-hydrogen lime-light, acetylene or electricity, and it is very hot, but good results are obtained with a suitable lamp well tended, and nearly all the smaller simple lanterns are illuminated in this way.

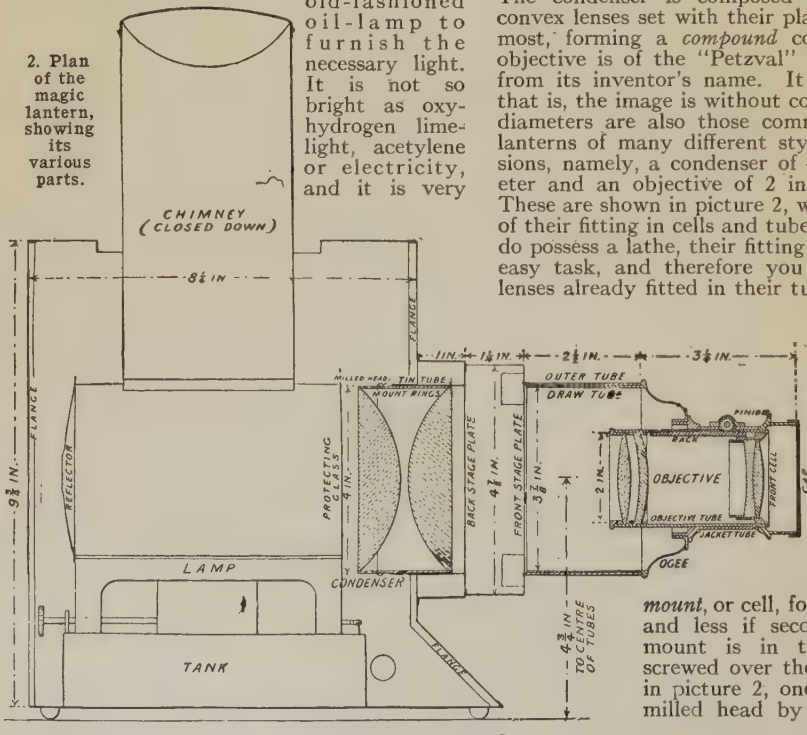


1. The principle of the magic lantern.

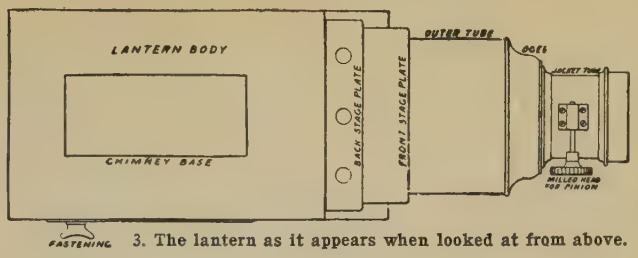
In settling the size of the lantern the cost of fittings must be considered, because what are termed the *optical parts* must be purchased, as you cannot make your own condenser and objective, nor can you make very easily the tubes in which they are mounted.

The most important part of the lantern is the optical. On this depends the clearness of the picture thrown on the screen. Many of the cheapest lanterns have simple lenses, but they do not give bright, clear definitions free from color rings. To insure good results, lenses must be combined in certain fashions, the reasons for which we shall understand some day when we study the laws which govern the refraction of light. There are many such combinations. Those which we select for this lantern are shown in picture 2, and are the ones which are most generally used. The condenser is composed of two plano-convex lenses set with their plane faces outermost, forming a *compound* condenser. The objective is of the "Petzval" form, so called from its inventor's name. It is achromatic, that is, the image is without color rings. The diameters are also those commonly used for lanterns of many different styles and dimensions, namely, a condenser of 4 inches' diameter and an objective of 2 inches' diameter. These are shown in picture 2, with the method of their fitting in cells and tubes. Even if you do possess a lathe, their fitting is not at all an easy task, and therefore you must buy the lenses already fitted in their tubes. Opticians supply these at prices which vary according to quality. Their names and fittings are as follows:

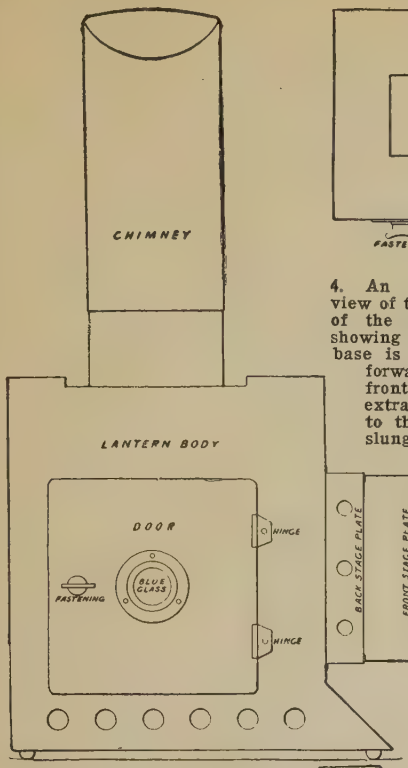
2. Plan of the magic lantern, showing its various parts.



A 4-inch condenser of compound plano-convex type may be purchased ready in its *mount*, or cell, for about $2 new, and less if second-hand. The mount is in two parts, one screwed over the other, as seen in picture 2, one ring having a milled head by which to turn



3. The lantern as it appears when looked at from above.



4. An outside view of the side of the lantern showing how the base is carried forward in front to give extra support to the over-slung tubes.

the screwed portion off and on. A few airholes are made, to prevent mist from forming. The back lens is liable to become cracked by the heat of the lamp. For this reason the lenses are fitted loosely in their mounts, so that they will rattle, and the hinder one is often protected with a disk of plain glass, as shown in picture 2.

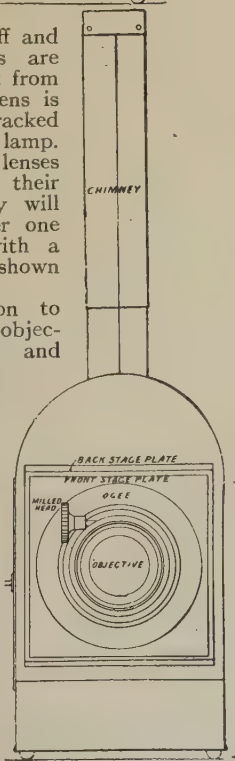
In essential relation to the condenser is the objective, which receives and transmits the light passing through the image to the screen. This is shown in picture 2, and comprises two distinct sets of lenses in a tube, which is slid by means of a rack and pinion in an outer, or jacket, tube —as also shown in picture 3—which has a connection to the condenser tube. The front combination comprises a double convex lens of crown glass—the front one in the picture—and a nearly plano-concave — actually a double-concave—lens of flint glass cemented to it with Canada balsam, the hinder one in the picture. This is mounted in a little cell—the front cell—distinct from the main objective tube, and screwed into the latter to permit of cleaning the inner faces of both front and back lenses. At the back there is a concavo-convex lens of flint glass, separated by a small space from a double-convex lens of crown glass. These are both secured in the rear end of the objective tube as shown.

The front of the objective is often fitted with a hinged cover termed a *flasher*, which shuts off the image from the screen. In this one a cap is fitted to the front tube, like that used on some cameras. But there are several types.

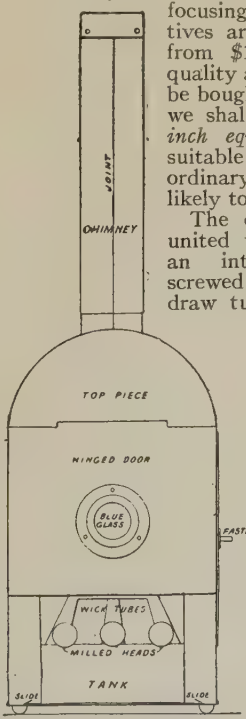
An objective of this kind can be purchased ready mounted in a polished brass objective tube, which slides in another brass tube termed the *jacket*, with a rack and pinion for effecting the adjustment. This is essential for exact focusing. Such mounted objectives are sold at prices ranging from $1 upward, according to quality and finish. They can also be bought second-hand. The one we shall choose should be of 6-*inch equivalent focus*, which is suitable for lantern work in an ordinary room such as we are likely to use.

The objective combination is united to a *draw tube*, through an intermediate *ogee*, being screwed into the latter. The draw tube is inserted, a sliding fit into an *outer tube*, as seen also in picture 3, which permits the lenses to be readily taken out of the lantern when not in use. The outer tube is fitted with an internal flange and soldered to the *front stage plate* or slide-carrier plate.

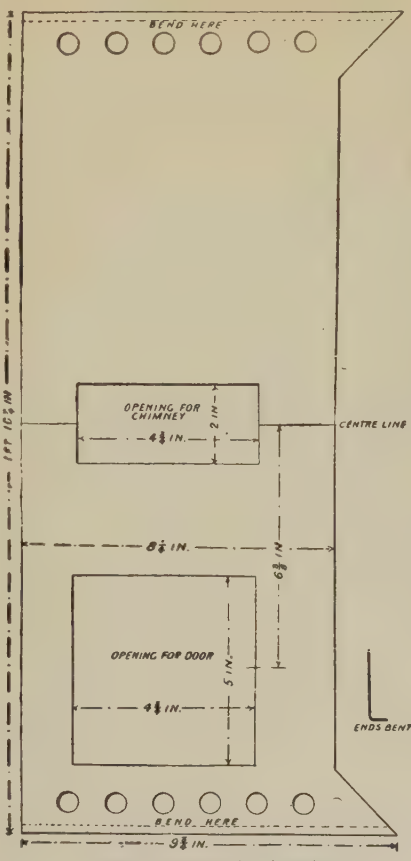
Between the condenser and the objective the picture slides have to be placed, and sundry plates have to be fitted to effect these connections. Behind the condenser is the lamp. These connec-



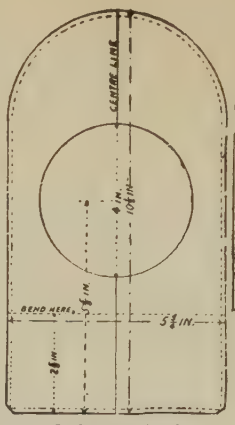
5. Front view of lantern.



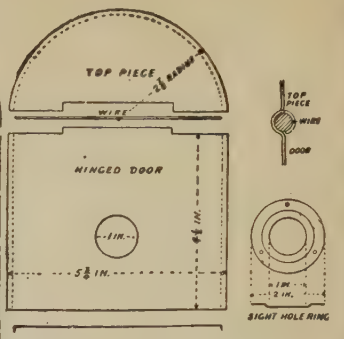
6. Back view of lantern.



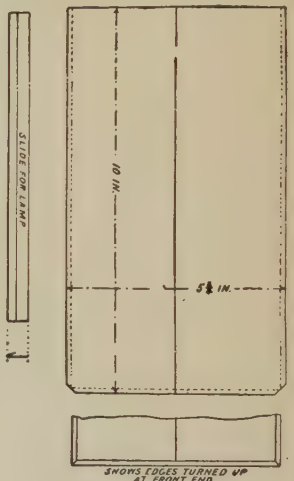
7. Sheet prepared for bending.



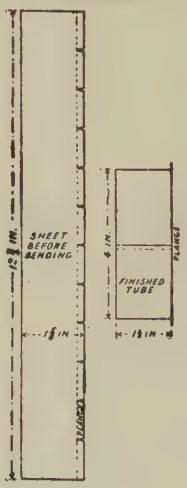
8. Front sheet.



9. The parts for back of lantern.



10. Bottom of lantern.

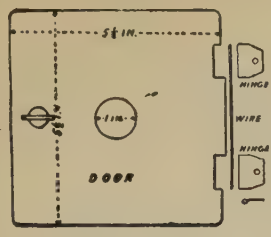


11. Tube for condenser.

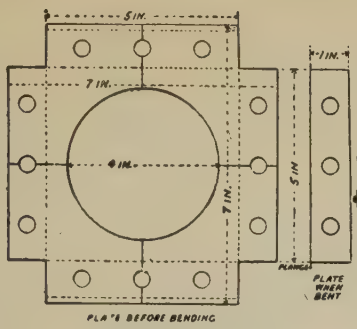
tions and details will be better studied after the body of the lantern has been made, which work we shall now take up. In the view given in picture 2, the lantern is supposed to have been cut down vertically through the centre. In picture 3 we are looking down on the outside of the lantern from above. In picture 4 you see the lantern from the side, in picture 5 from the front, and in picture 6 from the back. The base is carried forward at the front, as shown in pictures 2 and 4, to give extra support to the overhanging tubes.

The best lantern bodies are made of mahogany lined with sheet-iron, leaving an air-space of ¼ inch or so between the iron and the wood. You must make something simpler, as shown in the pictures. The body may be built either of sheet-iron or of tin. Russian sheet-iron is better than the ordinary quality. If tin is used it must be japanned black, but this can be done after it is made into shape. The tin can be cut with a strong pair of scissors, but if you can borrow a pair of shears from a friendly tinsmith, the work will be much easier. It is worked very readily, and you should meet with little difficulty in this part of the task. The lantern body, too, is designed as simply as possible, comprising only four distinct pieces of tin in the main portion. The sides and top are in one sheet, shown in picture 7; the ends are in two pieces, shown in pictures 8 and 9; and the bottom is in one piece, shown in picture 10.

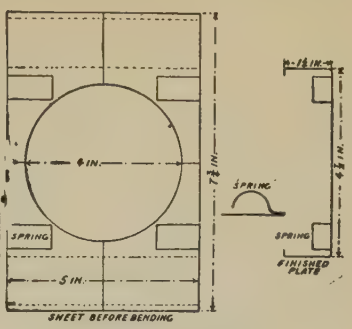
The sheet for the sides and top is made in one, to avoid jointing the top. It is cut to the dimensions given in picture 7, including an opening for the chimney, an opening for the door at the side, and six ½-inch round holes are cut at both ends to afford draft for the lamp. When marking this out, start from the *centre line*, cutting each half on each side of this line exactly alike, with the exception of the door-opening. As you will not cut the edges exactly correct with scissors or shears, a file will have to be used to produce accurate results. Also, the back edge must be finished smoothly, as you might not be able to manage a beaded edge well, which is done in shop lanterns. The sheet must be bent to a semicircle at the centre, as shown in pictures 5 and 6. The easiest way to do this is to plane a block of wood to the curve, and bend the sheet around that until it fits the curve exactly. Or you might find a piece of pipe of about the right curve. The extreme ends must be hammered and bent sharply over the edge of a block of iron or wood, as seen in pictures 5 and 6, and enlarged in picture 7, the object of which will be explained



12. The side door.



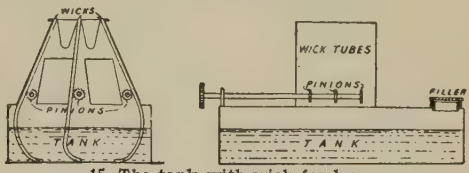
13. The back stage plate.



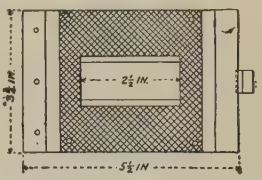
14. The front stage plate.

presently. The front end sheet, shown in picture 8, is made to the dimensions given, and has one hole cut in it to receive a *tin tube*, as shown in picture 2, in which the condenser-cell, or mount, is inserted. This sheet must have its edges, except the bottom edge, bent around from the dotted lines, as shown, to form a little flange to give sufficient breadth of surface to be soldered to the sheet, which has been cut and bent from picture 7. You can just see this flange in picture 2. This can be bent with a pair of pliers, but slits will have to be snipped at intervals of about one inch around the curved portion at the top. The flange can also be bent by hammering it around the edge of a block of wood curved to the radius of the top. Bending at the bottom must be done to correspond with pictures 2 and 7.

The back end piece, as shown in picture 9, comprises a semicircular piece at the top and a hinged door, seen also in picture 6. The first is flanged similarly to the front sheet, picture 8, and soldered to the top of the lantern. But a hinge has to be made in it, and the door fitted, before the soldering is done. Both pieces are notched, as shown in the picture, and turned over a piece of wire. An enlarged detail of this is seen to the right of picture 9. This bending-over is done with pliers, and finished neatly with light blows from a hammer. The edges of the door are bent backward toward the lantern body, seen below, to embrace the sides of the latter. A hole is cut to receive a disk of blue glass, used only if limelight is employed. The glass is held in by a ring riveted over it to the door seen to the right.



15. The tank with wick for lamp.

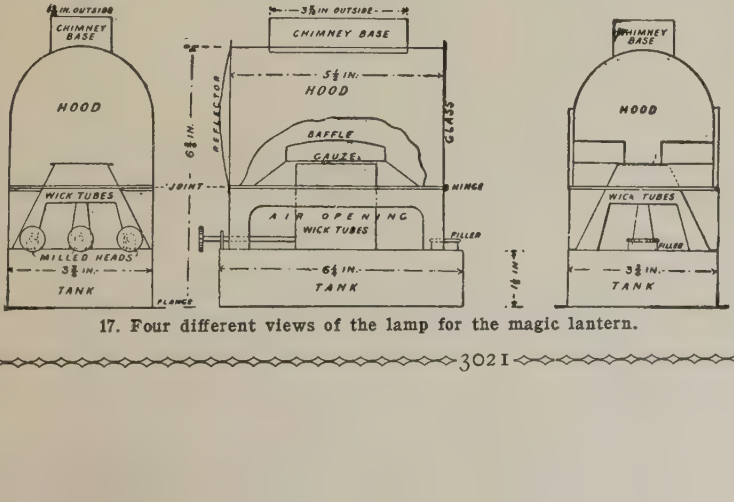


16. Bottom of hood with gauze.

Picture 10 shows the bottom, or floor, of the lantern. It is turned up and round at the sides and front to embrace the sides and front of the body, as shown in pictures 2 and 6. The bending-over is done with pliers, and may be finished by hammering, making a neat job without solder. Bent edges are seen at the bottom of picture 10. Knobs are soldered on the bottom to keep the lantern up off its support. The heads of large brass-headed nails will do for these, which are shown in pictures 2, 4 and 6. Two strips are soldered along the bottom inside, within which the foot of the lamp slides along, as seen in picture 6.

The door is fitted at one side, with a disk of blue glass in the centre, as seen in picture 4. The hinges are made separately and fitted to the door, and then soldered to the body, as in pictures 12 and 4. The glass disk is fitted as in picture 9. A fastening is made of a bit of brass, filed to the shape shown, and riveted to a pin which passes through the door and has a button on the outside to turn it by. A shop-made door is beaded, but beading may be omitted.

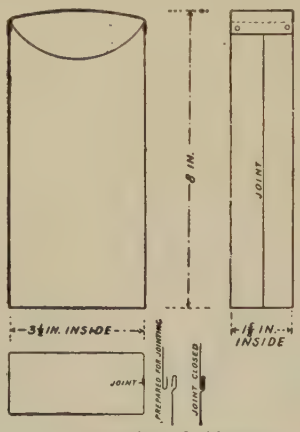
Now comes the connection between the lantern body and the optical tubes. This comprises, as you will see in pictures 2 and 4, a back stage plate, a tin tube, and a front stage plate, all of which you will find shown in detail in pictures 13, 11 and 14.



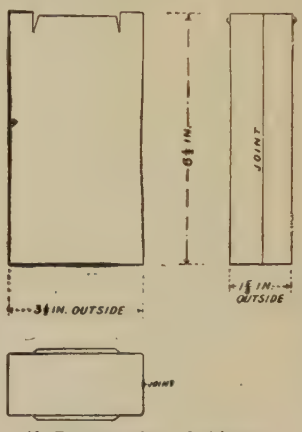
17. Four different views of the lamp for the magic lantern.

The *back stage plate*, as shown in picture 13, is made of a square sheet of tin notched and cut at the four corners and bent around square, the cut corners meeting. Three air-holes are also cut in each side, and the sides which are to form the top and bottom are bent around to form flanges, which are soldered to the front, as in pictures 2, 4 and 5. A little solder may be run into the corner joints.

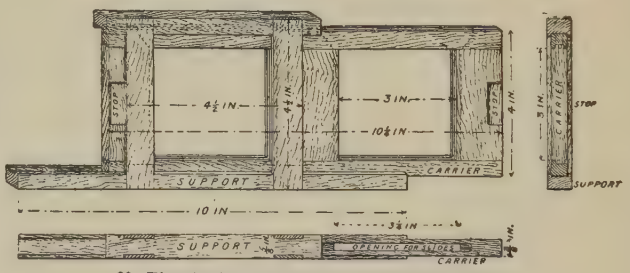
Before the plate is soldered into place, the *tin tube*, shown in picture 11, is made by bending a flange on one edge of a strip of tin, snipping it at intervals with a pair of scissors, and bending it to form a circle, soldering the joint. The flange is then soldered to the inner face of the stage plate, and the tube passes within the hole in the front plate of the lantern, as seen in picture 2. The *mount rings*, or cell, of the condenser lenses fit within the tube, sliding easily therein. The *front stage plate* is made as in picture 14. A piece of plate, cut to the dimensions given, is bent around at two ends, and at each of these ends a narrow flange is bent for soldering to the back stage plate. A hole is cut through to receive the *outer tube*, which has a narrow flange provided to be soldered to the plate, as seen also in picture 2. Four brass springs are made, and soldered by one end only, at top and bottom within the plate. These are a substitute for the more troublesome springs and pins which are fitted to shop lanterns. They yield a little on the insertion of a slide, and so accommodate their pressure to various kinds of slides which have different thicknesses. You come next to the lamp and chimney, seen in position in picture 2, and separately in pictures 15 to 19. Nearly the whole of the lamp is united by solder, and the chimney by means of joints without solder, which would become melted in the intense heat. These lamps can be purchased at a wonderfully small cost, complete with a chimney ready for use, but we describe and illustrate one for those who have plenty of time at their disposal and like to make things for themselves. The materials needed are few and not expensive.



18. Outer casing of chimney.



19. Inner casing of chimney.



20. The double carrier for the lantern slides.

The lamp contains three wicks, each in a separate tube, for burning paraffin, which is contained in the *tank* or reservoir at the bottom, poured in through a brass *filler* screwed at one end. The flanged edges of the tank slide along the ways soldered in the bottom of the body as in picture 6. The wicks are adjusted with the milled heads, each turning a toothed wheel beside its wick. The wicks approach at the top to give one broad flame. Air enters the openings provided at the sides and ends. The smoke is consumed in hot wire gauze and baffles, within the hood above. The hood is hinged to throw back, to permit of trimming the wicks. When closed, it rests on a light framework of wire soldered to the top of the tank. At one end of the hood there is a concave polished tin reflector to throw the light on to the condenser. At the other end a sheet of plain glass protects the condenser from excess of heat. Above there is a rectangular frame soldered on, over which the lower end of the chimney fits. The hood must be of blackened sheet, but the oil-tank is of common bright tin-plate. The method of union of the parts is shown in the picture of the tank alone on page 3021.

The chimney, shown in pictures 18 and 19, is made in two pieces, with a *telescopic draw*. The two parts slide freely over each other. But to insure that they shall remain as drawn out, at one end a breadth of the iron is snipped and pulled outward to afford by its springiness a certain amount of friction. Picture 20 shows the slide-carrier, which can easily be made of wood from this design.

It must be remembered that a magic lantern throws an inverted picture on the screen; that is, the picture is upside down. It is an easy matter to put the slide bottom edge up in the slide-holder. Then the screen result will appear in a normal position. Glass slides are the commonest objects used for lantern projection, but solid objects mounted on glass can be exhibited. It is possible to buy or make slides with movable parts. With care the slides can be colored true to life.

WHAT SCENE IN HISTORY IS THIS?

THE GAME OF "WHAT IS IT?"

HERE are some puzzle games to be played sitting round the fire, similar to those which appeared on page 2880. Below are descriptions of famous scenes in history. The solutions will be found on page 3118.

AN ANGRY SCENE IN A TENT

1. We are in a tent in a meadow by the bank of a river. In the tent are gathered a number of men armed after the fashion of the Middle Ages, and through the opening of the tent we see troops standing. The men in the tent look angry and determined, and bend threatening looks on one who is the centre of attention and wears a crown. The foremost man of the group is urging him to put his sign to a document spread out on a table before him. At last he consents, sets his seal on a lump of wax, and throws himself on the ground in a rage. Who is he, and what is the deed that he has been forced to do by others and now so very much regrets?

THE LANDING OF A BRAVE BAND

2. We are on the coast of a wild, uncultivated country. Behind the bare rock on which we stand, forest stretches away inland. Off the shore is a small bark at anchor, and from it we watch men, women and children landing. They are dressed in plain garments, and seem to belong to the artisan class. They are evidently weary, yet how brave they must be to cross that wild sea in their small boat of 180 tons, and land with their little children on an unknown shore. Who are they and why have they come here, where there is neither shelter nor food ready for them?

THE ROBBER AND THE LITTLE PRINCE

3. It is a time of anxiety and danger. All the countryside is disturbed by war. A battle has just been fought, and in the forest, near the battlefield, a mother and her boy have sought refuge. While wandering about hoping to escape notice, some robbers discover the mother and her little son, and take from them their money, jewelry and food, and then leave them. It is April. The trees are leafless, and the poor mother is anxious for her boy, who has been reared in the comfort of palaces. While seated on a tree-trunk she hears a footstep on the dry leaves, and fearing it is another robber, she loses heart. Then she thinks of her boy, who should one day be king of England. She rises and faces the newcomer, who is indeed a robber, but her pleadings rouse the pity of the man, who promises to take her and her boy safely to the coast, so that they may be able to escape to France. What incident is this, and does the robber keep the promise that he has made to take them to the coast?

THE WRITING ON THE CHURCH DOOR

4. Before us is a heavy church door studded with nails. A monk advances from the street holding a paper in his hands. He has a look of stern determination, and walks straight up to the church door. Now we can see that the paper is covered with writing. The monk takes from a bag a hammer and some nails and fastens the document onto the door; then he stands aside to watch the result. Some townsmen have been watching him, and curiosity prompts them to see what the daring monk has nailed to the church door. Three years later, at the gate of the castle near by, the same bold monk burned in a bonfire another document. Who was the monk, and what were the documents?

AN INTERRUPTED GAME OF BOWLS

5. We have before us a bowling green, where men are intent on their play. Near by stands a man gazing out to sea across the harbor. He pays no attention to the game, but stands shading his eyes from the sun with his hands. Suddenly he sees something, for he turns, and, striding up to one of the players, eagerly points out to him the beacon being lighted close by. But, to his surprise, the player goes on with his game of bowls, coolly remarking: "There is plenty of time to finish the game and beat the Spaniards too." Yet, all around, people are gazing out across the harbor, or making hurried preparations. Evidently some great event is about to take place, and all the men look determined, though anxious. What incident is this?

THE GREAT MAN ON A LITTLE ISLAND

6. We are on a small island, only about 86 square miles in extent, in the blue waters of the Mediterranean and within sight of the coast, where fishermen and iron-miners live. Before us is a large building, and through one of the windows we see a man seated at a table. He looks sullen and unhappy, as though he were brooding over his misfortunes, for he has fallen from greatness. Yet the power that he had was not used to help mankind; rather was it used to overreach others and subdue them to his will. No wonder he is unhappy and looks miserable! Sitting there in gloomy thought, he plots how he will escape from this island, which was given to him as his dominion, because it was thought he could there do no further mischief. Who is the man described here?

ANSWERS TO THE GAME OF "WHAT IS ITS NAME?"

ON page 2880 are some descriptions of animals, and we have to guess their names from the descriptions that are given.

These are the names of the different creatures:

1. Spider.
2. Tortoise.
3. Giraffe.
4. Ameba.
5. Bat.
6. Porpoise.

HOW TO HAVE FUN IN THE WATER

AFTER you have learned to swim well there is no limit to the fun you can have in the water. Here are several tricks which you may try in the summer time, or even in a tank at other times.

WALKING IN THE WATER

Do you think that you cannot walk in the water? Well, just try it, for you will be surprised what you can do. First, lie flat on your back in the position for floating, then start swimming feet foremost, using the leg action only. Quietly push one foot after the other with toes pointed, and give a downward pull, as though walking on a treadmill. The trick is not to kick the water away, but toward you. It is easy to do, but progress is slow.

ROLLING LOG

Take a position for floating again; then hold yourself quite stiff and clasp your hands high over your head. Take a deep breath, and with a movement of the head turn over like a rolling log, and keep on revolving rapidly. This is a breath-holding stunt, so remember to fill the lungs full of air. This is easy for the fat boy, but the tall thin one will have to wriggle considerably in order to revolve swiftly.

PEANUT-AND-SPOON RACE

Each contestant has a dessert-spoon with a peanut placed on it, and takes his place in line in the water with the other players. With the spoon-handle in his mouth, the swimmer starts at the signal "Go!" and tries to reach the stake, turn around it and return without dropping the peanut. If the peanut falls, the swimmer is out of the race.

RELAY RACE

Two men who are fast swimmers act as captains, choosing teams of four men each. The captains take their places at the rear of the lines and at the signal "Go!" the first man in line dives off and swims to the stake, touches it, turns around and swims back, touching the goal. The next man in line dives in over the head of the returning swimmer, and so on. The best swimmer has been saved for the last, so the contest becomes very exciting. The team which finishes first is the winner.

CANOE RACE FOR HAND PADDLERS

Four boys in bathing suits and two canoes are entered for this race. Two boys are seated in each canoe, one in the bow and the stronger lad in the stern. Paddling with the hands over the sides of the canoes, they struggle to reach the goal.

TORPEDO

Fill your lungs with a great deep breath, take the floating position, throw the hands high above the head, and, with a rapid propeller movement of the hands, shoot forward feet first. The entire body except the toes is submerged. It is easier to do this trick in salt water, as the fresh water has less buoyancy.

CANDLE RACE

On the float or dock, set up a row of candles, with matches near by. The boys all line up in a row a few yards distant. At the signal "Go!" the swimmers start for the candles, vying with one another in lighting them. The one who lights his candle and swims back, reaching the goal first, is the winner.

WHY ARE THERE DEFECTS IN LUMBER?

NO kind of tree produces lumber that is entirely free from defects and blemishes. The same irregularities in the wood, natural and accidental, are likely to occur in all kinds or species. In all woods used for the same purpose the effect of a certain defect on the strength and quality is found to be about the same, where all other conditions are nearly equal. Without doubt knots are considered the most common of the natural defects in lumber.

Nearly all branches of forest-grown trees originate at the centre of the trunk and grow in diameter and length so long as conditions are favorable. The branch-end, or knot, in the trunk is therefore typically shaped like a cone with its apex at the pith. A branch-end when sawed through appears on a flat-grain surface as a round knot and in vertical-grain material as a spike knot. Many of the lower branches in forest-grown trees die and fall off when the upper branches cut off too much of their light. As the tree continues its diameter growth, new wood surrounds the stubs of the old branches. When the log is cut up these covered stubs are found in the lumber as encased knots.

Most trees do not have pitch streaks or pitch pockets, but such blemishes are often found in softwoods. The amount of pitch often varies as much within a species as it does between species. A typical pitch pocket in southern yellow pine may be shorter and wider than one in Douglas fir, but if they are equal in area they are practically the same in damaging effect.

Of course the same kind of blemish-producing accidents happen to all kinds of wood. Holes produced by loose knots falling out, by grubs, insects and birds, and by tools appear in all kinds of lumber. Fire scars are likewise found in all species of trees. All woods are more or less subject to the attack of some decay-producing fungi.

Such defects as checks, cracks, splits, case-hardening, honeycombing, warping and other seasoning blemishes are also to be found in any kind of wood. Then there are manufacturing defects, such as planer skips—the result of cup, bow, crook and twist—which may occur in all species. Any lumber may have cross grain, shake or stain. While certain defects may be more prominent in one kind of wood than in another, it is found that there are more points of similarity than of difference in the defects existing in the various species of lumber which are commonly used to-day.

You will find it interesting to compare the several different kinds of wood at hand to note the extent of these defects in each one.

THE NEXT THINGS TO MAKE AND TO DO ARE ON PAGE 3113.